Access DB# 96868

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: MATTHEW A. ANDERSON Examiner #: 76766 Date: 6/18/03
Art Unit: 1765 Phone Number 308-0086 Serial Number: 09/961,024
Mail Box and Bldg Room Location: CP3-10E06 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

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Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc. if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Low Temperature Epitaxial Growth of Quaternary Wide Bandgap Semiconductors

Inventors (please provide full names): Kouvetakis (John); Tsong (Ignatius S.T.); Roucka (Radek); Tolle (John)

Earliest Priority Filing Date: 9/26/2001

***For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.**

Please see enclosed claims.

* Note applicant has elected only 1-11, 14-20, 34, 38 *
others are off the table for now

YCZN where

Y is a Group IV element (Si, Ge, C, Sn, Pb, Ti, Zr, Hf)

C is carbon

Z is Group III element (B, Al, Ga, In, Tl, Sc, Y, La)

Examples of compounds from spec.

~~GeD_3CN (D = deuterium)~~

SiCGaN, SiCInN, GeCGaN, SnCInN, GeCInN,
SiCAlN, GeCAlN,

Thanks!

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STAFF USE ONLY		Type of Search		Vendors and cost where applicable	
Searcher:	EL	NA Sequence (#)		STN	$236.92
Searcher Phone #:		AA Sequence (#)		Dialog	
Searcher Location:		Structure (#)	✓ (2)	Questel/Orbit	
Date Searcher Picked Up:		Bibliographic	✓ (and)	Dr.Link	
Date Completed:	6-18-03	Litigation		Lexis/Nexis	
Searcher Prep & Review Time:	10	Fulltext		Sequence Systems	
~~Clerical Prep Time:~~		Patent Family		WWW/Internet	
Online Time:	85	Other		Other (specify)	

PTO-1590 (8-01)

CLAIMS

We Claim:

1. A method for depositing an epitaxial thin film having the quaternary formula YCZN wherein Y is a Group IV element and Z is a Group III element on a substrate at temperature between ambient temperature and 1000°C in a gas source molecular beam epitaxial chamber, comprising introducing into said chamber:

   i. gaseous flux of precursor H_3YCN wherein H is hydrogen or deuterium; and

   ii. vapor flux of Z atoms;

   under conditions whereby said precursor and said Z atoms combine to form epitaxial YCZN on said substrate.

2. The method of Claim 1 wherein said temperature is about 550°C to 750°C.

3. The method of Claim 1 wherein said substrate is silicon or silicon carbide.

4. The method of Claim 3 wherein said substrate is Si(111) or α-SiC(0001).

5. The method of Claim 3 wherein said substrate is a large-diameter silicon wafer.

6. The method of Claim 5 wherein said silicon wafer comprises Si(111).

7. The method of Claim 4 wherein said substrate is α-SiC(0001) comprising the additional step of cleaning said substrate prior to deposition of said quaternary film.

8. The method of Claim 7 wherein said cleaning step comprises hydrogen etching.

9. The method of Claim 1 wherein said substrate is Si(111) comprising a buffer layer, and said epitaxial semiconductor is deposited on said buffer layer.

10. The method of Claim 7 wherein said buffer layer is a Group III nitride.

11. The method of Claim 8 wherein said buffer layer is AlN.

12. Layered semiconductor structure made by the method of Claim 9.

13. A microelectronic or optoelectronic device comprising a layered semiconductor structure of Claim 12.

14. The method of Claim 1 wherein Y is silicon, germanium or tin.

15. The method of Claim 1 wherein Z is aluminum, gallium or indium.

16. The method of Claim 1 wherein Z is boron.

17. The method of Claim 1 for depositing thin film YCZN wherein Y is silicon and said precursor is H_3SiCN.

18. The method of Claim 1 for depositing the thin film YCZN wherein Y is germanium and said precursor is H_3GeCN.

19. The method of Claim 1 for depositing epitaxial thin film SiCZN on a substrate wherein said precursor is H_3SiCN, said Z atom is aluminum and said substrate is Si(111) or α-SiC(0001).

20. The method of Claim 1 for depositing epitaxial thin film GeCZN on a substrate wherein said precursor is D_3GeCN, said Z atom is aluminum and said substrate is Si(111) or α-SiC(0001).

21. Epitaxial thin film having the formula YCZN wherein Y is a Group IV element and Z is a Group III element or a transition metal, made by the method of Claim 1.

22. Epitaxial thin film having the formula YCZN wherein Y is a Group IV element and Z is a Group III element or a transition metal, made by the method of Claim 5.

23. Epitaxial thin film semiconductor having the formula SiCAlN made by the method of Claim 5.

24. Epitaxial thin film semiconductor made by the method of Claim 1, said semiconductor having the quaternary formula YCZN wherein Y is a Group IV element and Z is aluminum, gallium or indium.

25. Optoelectronic device comprising epitaxial thin film semiconductor of Claim 24.

26. Optoelectronic device of Claim 25 wherein said semiconductor is SiCAlN or GeCAlN.

27. Microelectronic devices comprising epitaxial thin film semiconductor of Claim 24.

28. Microelectronic device of Claim 27 wherein said semiconductor is SiCAlN or GeCAlN.

29. Multi-quantum-well structures comprising epitaxial film semiconductor of Claim 24.

30. Light-emitting diodes and laser diodes comprising multi-quantum well structures of Claim 29.

31. Precursor for the synthesis of epitaxial semiconductors having the formula YCZN wherein Y is a Group IV element and Z is selected from the group comprising aluminum, gallium and indium, said precursor having the formula H_3YCN wherein H is hydrogen or deuterium.

32. Precursor of Claim 31 having the formula H_3SiCN

33. Precursor of Claim 31 having the formula H_3GeCN.

34. The method of Claim 1 for depositing epitaxial thin film having the formula $(YC)_{(0.5-x)}(ZN)_{(0.5+x)}$ wherein x is chosen to be a value $0<x>0.5$, and Z is the same or different in each occurrence, comprising in addition the step of introducing into said chamber a flux of nitrogen atoms and maintaining the flux of said precursor, said nitrogen atoms and said Z atoms at a ratio selected to produce quaternary semiconductors having said chosen value of x.

35. Epitaxial thin film made by the method of Claim 34.

36. Optoelectronic device comprising epitaxial thin film of Claim 35.

37. Microelectronic device comprising epitaxial thin film of Claim 35.

38. The method of Claim 34 for producing a quaternary YCZN semiconductor having a desired bandgap, YC and ZN having different bandgaps and Y and Z being the same or different in each occurrence, wherein the flux of precursor, Z atoms and N atoms is maintained at a ratio known to produce a film having the desired bandgap.

39. Multi-quantum-well structures comprising epitaxial films of Claim 35.

40. Light-emitting diodes and laser diodes comprising multi-quantum well structures of Claim 39.

41. An optoelectronic device comprising a semiconductor device of Claim 35.

42. Optoelectronic device of Claim 41 selected from the group comprising light-emitting diodes, laser diodes, field emission flat-panel displays and ultraviolet detectors and sensors.

43. Superhard coating made by the method of Claim 1.

44. Superhard coating of Claim 43 wherein Z is boron.

45. Large-area substrate of SiCAlN grown on large diameter Si(111) wafers by the method of Claim 5 for the growth of conventional Group III nitride films.

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=> file reg
FILE 'REGISTRY' ENTERED AT 18:33:49 ON 18 JUN 2003
USE IS SUBJECT TO THE TERMS OF YOUR STN CUSTOMER AGREEMENT.
PLEASE SEE "HELP USAGETERMS" FOR DETAILS.
COPYRIGHT (C) 2003 American Chemical Society (ACS)


=> display history full l1-


     FILE 'LCA' ENTERED AT 17:40:18 ON 18 JUN 2003
L1          7646 SEA (FILM? OR THINFILM? OR LAYER? OR OVERLAY? OR
                 OVERLAID? OR LAMIN? OR LAMEL? OR SHEET? OR LEAF? OR
                 FOIL? OR COAT? OR TOPCOAT? OR OVERCOAT? OR VENEER? OR
                 SHEATH? OR COVER? OR ENVELOP? OR ENCAS? OR ENWRAP? OR
                 OVERSPREAD?)/BI,AB

     FILE 'HCA' ENTERED AT 17:42:09 ON 18 JUN 2003
L2         48692 SEA EPITAX?(2A)(FILM? OR THINFILM? OR LAYER? OR OVERLAY?
                 OR OVERLAID? OR LAMIN? OR LAMEL? OR SHEET? OR LEAF? OR
                 FOIL? OR CLAD? OR COAT? OR TOPCOAT? OR OVERCOAT? OR
                 VENEER? OR SHEATH? OR COVER? OR ENVELOP? OR ENCAS? OR
                 ENWRAP? OR OVERSPREAD?)
L3         96261 SEA EPITAX? AND (FILM? OR THINFILM? OR LAYER? OR
                 OVERLAY? OR OVERLAID? OR LAMIN? OR LAMEL? OR SHEET? OR
                 LEAF? OR FOIL? OR CLAD? OR COAT? OR TOPCOAT? OR OVERCOAT?
                  OR VENEER? OR SHEATH? OR COVER? OR ENVELOP? OR ENCAS?
                 OR ENWRAP? OR OVERSPREAD?)

     FILE 'REGISTRY' ENTERED AT 18:03:14 ON 18 JUN 2003
L4        364465 SEA (A4 OR B4)/PG (L) C/ELS (L) N/ELS
L5         23084 SEA L4 (L) (H OR D)/ELS (L) 4/ELC.SUB
L6            11 SEA L5 AND TIS/CI
L7           419 SEA L4 (L) (A3 OR B3)/PG (L) 4/ELC.SUB

     FILE 'HCA' ENTERED AT 18:08:38 ON 18 JUN 2003
                 E COATING MATERIALS/CV
L8        234471 SEA "COATING MATERIALS"/CV
                 E COATING PROCESS/CV
L9        104393 SEA "COATING PROCESS"/CV
L10        24691 SEA L5
L11          590 SEA L7
L12          180 SEA L7/P
L13           15 SEA L2 AND L11
L14           24 SEA L3 AND L11
L15            5 SEA L12 AND (L2 OR L3)
L16          148 SEA L11 AND (L8 OR L9)
L17            2 SEA L16 AND EPITAX?
L18           34 SEA L12 AND (L8 OR L9)
L19            1 SEA L18 AND EPITAX?
L20           17 SEA L10 AND L11
L21            8 SEA L20 AND (L1 OR CLAD? OR L8 OR L9)
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L22            5 SEA L20 AND EPITAX?
L23            7 SEA L6
L24            0 SEA L23 AND L11

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L25           89 SEA KOUVETAKIS ?/AU
L26         4348 SEA TSONG ?/AU OR TSANG ?/AU
L27           34 SEA ROUCKA ?/AU
L28          350 SEA TOLLE ?/AU
L29            9 SEA L25 AND L26 AND L27 AND L28
                 SEL L29 1-9 RN

     FILE 'REGISTRY' ENTERED AT 18:25:21 ON 18 JUN 2003
L30           27 SEA (1111-70-2/BI OR 7429-90-5/BI OR 143384-60-5/BI OR

L31            4 SEA L30 AND H/ELS
                 D L31 1-4 RN STR
                 SEL L31 1,2,4 RN
L32            3 SEA (1111-70-2/BI OR 14009-86-0/BI OR 1863-70-3/BI)
L33           23 SEA L30 NOT L31
L34           17 SEA L33 AND TIS/CI
L35            6 SEA L33 NOT L34


     FILE 'HCA' ENTERED AT 18:30:18 ON 18 JUN 2003
L36           79 SEA L32
L37          136 SEA L34
L38            4 SEA L36 AND L37
L39           13 SEA L15 OR L17 OR L19 OR L21 OR L22 OR L38
L40            7 SEA L13 NOT L39
L41            7 SEA L14 NOT (L39 OR L40)
L42            9 SEA L20 NOT (L39 OR L40 OR L41)

=> file hca
FILE 'HCA' ENTERED AT 18:34:38 ON 18 JUN 2003
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=> d l39 1-13 cbib abs hitstr hitind
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L39 ANSWER 1 OF 13 HCA COPYRIGHT 2003 ACS

138:330103 Low temperature **epitaxial** growth of quaternary wide bandgap semiconductors. Tsong, Ignatius S. T.; Kouvetakis, John; Roucka, Radek; Tolle, John (Arizona Board of Regents, USA). PCT Int. Appl. WO 2003033781 A1 20030424, 44 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU,

LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2002-US33134 20021016. PRIORITY: US 2001-981024 20011016; US 2002-PV380998 20020516.

AB A low temp. method for growing quaternary **epitaxial films** XCZN wherein X is a Group IV element and Z is a Group III element. A Gaseous flux of precursor H3XCN and a vapor flux of Z atoms are introduced into a gas-source mol. beam **epitaxial** (MBE) chamber to form thin **film** of XCZN on a substrate preferably of Si or Si carbide. Si substrates may comprise a native oxide **layer**, thermal oxide **layer**, AlN/Si structures or an interface of Al-O-Si-N formed from interlayers of Al on the SiO2 **layer**. **Epitaxial** thin **film** SiCAlN and GeCAlN are provided. Bandgap engineering is disclosed. Semiconductor devices produced by the present method exhibit bandgaps and spectral ranges which make them useful for optoelectronic and microelectronic applications. SiCAlN deposited on large-diam. Si wafers are substrates for growth of conventional Group III nitrides such as AlN. The quaternary compds. exhibit extreme hardness.

IT **128516-12-1D**, Aluminum silicon carbide nitride (Al0.5Si0.5C0.5N0.5), silicon-rich **321885-10-3D**, Boron silicon carbide nitride (BSiCN), nonstoichiometric **512774-82-2D**, Aluminum germanium carbide nitride (AlGeCN), germanium-rich **512774-83-3D**, Aluminum tin carbide nitride (AlSnCN), nonstoichiometric **512774-84-4D**, Gallium silicon carbide nitride (GaSiCN), nonstoichiometric **512774-85-5D**, Gallium germanium carbide nitride (GaGeCN), nonstoichiometric **512774-86-6D**, Gallium tin carbide nitride (GaSnCN), nonstoichiometric **512774-87-7D**, Indium silicon carbide nitride (InSiCN), nonstoichiometric **512774-88-8D**, Germanium indium carbide nitride (GeInCN), nonstoichiometric **512774-89-9D**, Indium tin carbide nitride (InSnCN), nonstoichiometric **512774-90-2D**, Boron germanium carbide nitride (BGeCN), nonstoichiometric **512774-91-3D**, Boron tin carbide nitride (BSnCN), nonstoichiometric
(low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)

RN 128516-12-1 HCA

CN Aluminum silicon carbide nitride (Al0.5Si0.5C0.5N0.5) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.5	17778-88-0
C	0.5	7440-44-0
Si	0.5	7440-21-3
Al	0.5	7429-90-5

RN 321885-10-3 HCA
CN Boron silicon carbide nitride (BSiCN) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	1	17778-88-0
C	1	7440-44-0
B	1	7440-42-8
Si	1	7440-21-3

RN 512774-82-2 HCA
CN Aluminum germanium carbide nitride (AlGeCN) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	1	17778-88-0
Ge	1	7440-56-4
C	1	7440-44-0
Al	1	7429-90-5

RN 512774-83-3 HCA
CN Aluminum tin carbide nitride (AlSnCN) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	1	17778-88-0
C	1	7440-44-0
Sn	1	7440-31-5
Al	1	7429-90-5

RN 512774-84-4 HCA
CN Gallium silicon carbide nitride (GaSiCN) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	1	17778-88-0
Ga	1	7440-55-3
C	1	7440-44-0
Si	1	7440-21-3

RN 512774-85-5 HCA
CN Gallium germanium carbide nitride (GaGeCN) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	1	17778-88-0

Ge	1	7440-56-4
Ga	1	7440-55-3
C	1	7440-44-0

RN 512774-86-6 HCA
CN Gallium tin carbide nitride (GaSnCN) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	1	17778-88-0
Ga	1	7440-55-3
C	1	7440-44-0
Sn	1	7440-31-5

RN 512774-87-7 HCA
CN Indium silicon carbide nitride (InSiCN) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	1	17778-88-0
In	1	7440-74-6
C	1	7440-44-0
Si	1	7440-21-3

RN 512774-88-8 HCA
CN Germanium indium carbide nitride (GeInCN) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	1	17778-88-0
In	1	7440-74-6
Ge	1	7440-56-4
C	1	7440-44-0

RN 512774-89-9 HCA
CN Indium tin carbide nitride (InSnCN) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	1	17778-88-0
In	1	7440-74-6
C	1	7440-44-0
Sn	1	7440-31-5

RN 512774-90-2 HCA
CN Boron germanium carbide nitride (BGeCN) (9CI) (CA INDEX NAME)

Component	Ratio	Component

		Registry Number
N	1	17778-88-0
Ge	1	7440-56-4
C	1	7440-44-0
B	1	7440-42-8

RN 512774-91-3 HCA
CN Boron tin carbide nitride (BSnCN) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	1	17778-88-0
C	1	7440-44-0
B	1	7440-42-8
Sn	1	7440-31-5

IT **1111-70-2**, Silanecarbonitrile **1863-70-3**, Germanecarbonitrile **14009-86-0**, Germanecarbonitrile-d3
(precursor; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)
RN 1111-70-2 HCA
CN Silanecarbonitrile (7CI, 8CI, 9CI) (CA INDEX NAME)

H_3Si C N

RN 1863-70-3 HCA
CN Germanecarbonitrile (7CI, 8CI, 9CI) (CA INDEX NAME)

H_3Ge C — N

RN 14009-86-0 HCA
CN Germanecarbonitrile-d3 (7CI, 8CI, 9CI) (CA INDEX NAME)

D

D — Ge — CN

D

IC ICM C30B025-00
CC 76-3 (Electric Phenomena)
Section cross-reference(s): 73, 75
ST low temp **epitaxial** growth quaternary wide bandgap semiconductor MBE
IT Optical detectors
(UV; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)

IT Group IIIA element nitrides
(buffer **layer**; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)

IT Semiconductor **films**
(**epitaxial**; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)

IT Optical imaging devices
(flat panels, field emission; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)

IT Electroluminescent devices
Microelectronic devices
Molecular beam **epitaxy**
Optoelectronic semiconductor devices
Quantum well devices
Semiconductor lasers
Semiconductor sensors
(low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)

IT **Epitaxial films**
(semiconductive; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)

IT 24304-00-5, Aluminum nitride (AlN)
(buffer **layer**; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)

IT **128516-12-1D**, Aluminum silicon carbide nitride (Al0.5Si0.5C0.5N0.5), silicon-rich **321885-10-3D**, Boron silicon carbide nitride (BSiCN), nonstoichiometric **512774-82-2D**, Aluminum germanium carbide nitride (AlGeCN), germanium-rich **512774-83-3D**, Aluminum tin carbide nitride (AlSnCN), nonstoichiometric **512774-84-4D**, Gallium silicon carbide nitride (GaSiCN), nonstoichiometric **512774-85-5D**, Gallium germanium carbide nitride (GaGeCN), nonstoichiometric **512774-86-6D**, Gallium tin carbide nitride (GaSnCN), nonstoichiometric **512774-87-7D**, Indium silicon carbide nitride (InSiCN), nonstoichiometric **512774-88-8D**, Germanium indium carbide nitride (GeInCN), nonstoichiometric **512774-89-9D**, Indium tin carbide nitride (InSnCN), nonstoichiometric **512774-90-2D**, Boron germanium carbide nitride (BGeCN), nonstoichiometric **512774-91-3D**, Boron tin carbide nitride (BSnCN), nonstoichiometric
(low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)

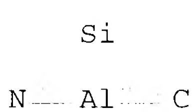
IT 7429-90-5, Aluminum, processes 7631-86-9, Silica, processes
(low temp. **epitaxial** growth of quaternary wide bandgap semiconductors on Si substrate having Si-O-Al-N interface formed from interlayers of Al on SiO2 **layer**)

IT **1111-70-2**, Silanecarbonitrile **1863-70-3**, Germanecarbonitrile **14009-86-0**, Germanecarbonitrile-d3
(precursor; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)

IT 409-21-2, Silicon carbide (SiC), processes
(substrate; low temp. **epitaxial** growth of quaternary

wide bandgap semiconductors)
IT 7440-21-3, Silicon, processes
(substrate; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors on Si substrate having Si-O-Al-N interface formed from interlayers of Al on SiO2 **layer**)

L39 ANSWER 2 OF 13 HCA COPYRIGHT 2003 ACS
138:295068 Novel synthetic pathways to wide bandgap semiconductors in the Si-C-Al-N system. Tolle, John; Roucka, Radek; Chizmeshya, Andrew V. G.; Crozier, Peter A.; Smith, David. J.; Tsong, Ignatius S. T.; Kouvetakis, John (Department of Chemistry and Biochemistry, Arizona State University, Tempe, AZ, 85287, USA). Solid State Sciences, 4(11-12), 1509-1519 (English) 2002. CODEN: SSSCFJ. ISSN: 1293-2558. Publisher: Editions Scientifiques et Medicales Elsevier.
AB **Epitaxial** SiCAlN **films** with single-phase wurtzite structures were grown by MBE via reactions of a specifically designed mol. precursor H3SiCN and Al atoms at 750.degree., considerably below the miscibility gap of SiC and AlN at 1900.degree.. The **film** growth was conducted directly on Si(111) despite the 19% lattice mismatch between the two materials. Commensurate heteroepitaxy was facilitated by the conversion of native and thermally grown SiO2 **layers** into cryst. Si-Al-N-O interfaces in registry with the Si(111) surface. This cryst. interface acted as a template for nucleation and growth of SiCAlN. Integration of wide bandgap semiconductors including AlN and GaN with Si was achieved by this process. Perfectly **epitaxial** SiCAlN was also grown on 6H-SiC(0001) substrates and exhibited novel crystallog. and phys. properties such as hexagonal structures with 2H/2H and 4H/2H SiC/AlN stacking, metastable cubic structures, wide bandgaps in the UV, and extreme mech. hardness. These properties were measured by a wide range of characterization techniques and ab initio d. functional theory simulations were used to elucidate the structural and spectroscopic behavior.
IT **143384-60-5P**, Aluminum silicon carbide nitride (AlSiCN)
(MBE of AlSiCN single-phase wurtzite-type **films** on silicon via reactions of specifically designed mol. precursor H3SiCN and Al atoms at 750.degree.)
RN 143384-60-5 HCA
CN Aluminum silicon carbide nitride (AlSiCN) (9CI) (CA INDEX NAME)



IT **1111-70-2**, Cyanosilane
(MBE of AlSiCN single-phase wurtzite-type **films** on silicon via reactions of specifically designed mol. precursor H3SiCN and Al atoms at 750.degree.)
RN 1111-70-2 HCA
CN Silanecarbonitrile (7CI, 8CI, 9CI) (CA INDEX NAME)

H_3Si C N

CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 76

IT Molecular beam **epitaxy**
(MBE of AlSiCN single-phase wurtzite-type **films** on silicon via reactions of specifically designed mol. precursor H3SiCN and Al atoms at 750.degree.)

IT Crystal nucleation
Interface
(conversion of native and thermally grown SiO2 **layers** into cryst. Si-Al-N-O interfaces on Si(111) surface during reaction of precursor H3SiCN with Al atoms as nucleation template for MBE of SiCAlN)

IT Hardness (mechanical)
Surface structure
(of SiCAlN **epitaxial films** on silicon)

IT Interfacial structure
(of SiCAlN **epitaxial films** on silicon and silicon carbide substrates)

IT **Coating materials**
(superhard; of AlSiCN single-phase wurtzite-type **films** on silicon via reactions of specifically designed mol. precursor H3SiCN and Al atoms at 750.degree.)

IT **143384-60-5P**, Aluminum silicon carbide nitride (AlSiCN)
(MBE of AlSiCN single-phase wurtzite-type **films** on silicon via reactions of specifically designed mol. precursor H3SiCN and Al atoms at 750.degree.)

IT **1111-70-2**, Cyanosilane 7429-90-5, Aluminum, reactions
(MBE of AlSiCN single-phase wurtzite-type **films** on silicon via reactions of specifically designed mol. precursor H3SiCN and Al atoms at 750.degree.)

L39 ANSWER 3 OF 13 HCA COPYRIGHT 2003 ACS
138:278738 Low temperature **epitaxial** growth of quaternary wide bandgap semiconductors. Kouvetakis, John; Tsong, Ignatius S. T.; Roucka, Radek; Tolle, John (USA). U.S. Pat. Appl. Publ. US 2003056719 A1 20030327, 23 pp., Cont.-in-part of U.S. Ser. No. 965,022. (English). CODEN: USXXCO. APPLICATION: US 2001-981024 20011016. PRIORITY: US 2001-965022 20010926.

AB A method of growing quaternary **epitaxial films** YCZN wherein Y is a Group IV element and Z is a Group III element at temps. in the range 550-750.degree. is provided. In the method, a gaseous flux of precursor H3YCN and a vapor flux of Z atoms are introduced into a gas-source mol. beam **epitaxial** (GSMBE) chamber where they combine to form thin **film** of YCZN on the substrate. Preferred substrates are Si, Si carbide and AlN/Si structures. **Epitaxial** thin **film** SiCAlN and GeCAlN are provided. Bandgap engineering may be achieved by the method by adjusting reaction parameters of the GSMBE process and the

relative concns. of the constituents of the quaternary alloy **films**. Semiconductor devices produced by the present method have bandgaps from .apprx.2 eV to .apprx.6 eV and exhibit a spectral range from visible to UV which makes them useful for a variety of optoelectronic and microelectronic applications. Large-area substrates for growth of conventional Group III nitrides and compds. are produced by SiCAlN deposited on large-diam. Si wafers. The quaternary compds., esp. the B contg. compds., exhibit extreme hardness. These quaternary compds. are radiation resistant and may be used in space exploration.

IT **157094-36-5**, Aluminum carbide nitride silicide
503159-94-2, Aluminum germanium carbide nitride
(**films**; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)

RN 157094-36-5 HCA
CN Aluminum carbide nitride silicide (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	x	17778-88-0
C	x	7440-44-0
Si	x	7440-21-3
Al	x	7429-90-5

RN 503159-94-2 HCA
CN Aluminum germanium carbide nitride (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	x	17778-88-0
Ge	x	7440-56-4
C	x	7440-44-0
Al	x	7429-90-5

IT **1111-70-2**, Silanecarbonitrile **1863-70-3**, Germanecarbonitrile **14009-86-0**, Germanecarbonitrile-d3
(precursor; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)

RN 1111-70-2 HCA
CN Silanecarbonitrile (7CI, 8CI, 9CI) (CA INDEX NAME)

$H_3Si-C\equiv N$

RN 1863-70-3 HCA
CN Germanecarbonitrile (7CI, 8CI, 9CI) (CA INDEX NAME)

$H_3Ge-C\equiv N$

RN 14009-86-0 HCA
CN Germanecarbonitrile-d3 (7CI, 8CI, 9CI) (CA INDEX NAME)

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   D
   |
D  Ge—CN
   |
   D
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IC ICM C30B023-00
ICS C30B025-00; C30B028-12; C30B028-14
NCL 117104000
CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 73, 76
IT Group IIIA element nitrides
(buffer **layer**; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)
IT Semiconductor **films**
(**epitaxial**; low temp. growth of quaternary wide bandgap **epitaxial film** semiconductors)
IT Electroluminescent devices
Electrooptical instruments
Microelectronics
Quantum well devices
Semiconductor lasers
(including quaternary wide bandgap **epitaxial film** semiconductors)
IT Molecular beam **epitaxy**
(low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)
IT **Epitaxial films**
(low temp. growth of quaternary wide bandgap **epitaxial film** semiconductors)
IT **Epitaxial films**
(semiconductive; low temp. growth of quaternary wide bandgap **epitaxial film** semiconductors)
IT Hardfacing
(super; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)
IT 24304-00-5, Aluminum nitride (AlN)
(buffer **layer**; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)
IT 1333-74-0, Hydrogen, uses
(etchant; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)
IT **157094-36-5**, Aluminum carbide nitride silicide
503159-94-2, Aluminum germanium carbide nitride
(**films**; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)
IT **1111-70-2**, Silanecarbonitrile **1863-70-3**, Germanecarbonitrile **14009-86-0**, Germanecarbonitrile-d3

(precursor; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)

IT 409-21-2, Silicon carbide, processes 7440-21-3, Silicon, processes (substrate; low temp. **epitaxial** growth of quaternary wide bandgap semiconductors)

L39 ANSWER 4 OF 13 HCA COPYRIGHT 2003 ACS

138:15829 From nitride to carbide: control of zirconium-based hard materials **film** growth and their characterization.
Morstein, M.; Willmott, P. R.; Spillmann, H.; Doebeli, M. (Platit AG, Grenchen, 2540, Switz.). Applied Physics A: Materials Science & Processing, 75(6), 647-654 (English) 2002. CODEN: APAMFC. ISSN: 0947-8396. Publisher: Springer-Verlag.

AB High-quality thin **films** of ZrCyN1-y and the novel tribol. material Zr0.8Al0.2CyN1-y have been grown by pulsed reactive crossed-beam laser ablation using Zr and Zr-Al ablation targets, resp., and a pulsed gas. The gas mixt. provided the carbon and nitrogen for the solid-soln. **films**. Control of the stoichiometry (i.e., y) was detd. by the relative partial pressures of the nitrogen- and carbon-contg. gases. It was found that optimal control of the **film** chem. was achieved by using the least thermally reactive gases. In this manner, it was possible to activate the gas species exclusively by collisions in the gas phase with the ablation-plume particles, thereby decoupling the chem. from surface processes. The **films** were characterized for their chem., crystallog., optical, and tribol. properties. All the **films** had very low impurity levels and a cubic rock salt crystal structure over the entire investigated temp. range 100-600.degree.. Exceedingly high-quality **epitaxial films** could be grown on MgO (001) at 600.degree.C. **Films** grown on stainless steel were polycryst. The hardness of the **films** showed a max. for both sets for stoichiometries predicted by a recent theor. model for hardness based on band-structure calcns. In addn., all the **films** had an exceptionally low coeff. of friction vs. steel. c2h6, c2h4.

IT **477780-91-9P**, Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.1N0.9) **477780-92-0P**, Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.2N0.8) **477780-93-1P**, Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.4N0.6) **477780-94-2P**, Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.6N0.4) **477781-67-2P**, Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.7N0.3)
(**films**; pulsed reactive crossed-beam laser ablation deposition and properties of Zr carbonitride and Al Zr carbonitride **epitaxial films**)

RN 477780-91-9 HCA

CN Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.1N0.9) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number

N	0.9	17778-88-0
Zr	0.8	7440-67-7
C	0.1	7440-44-0
Al	0.2	7429-90-5

RN 477780-92-0 HCA
CN Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.2N0.8) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.8	17778-88-0
Zr	0.8	7440-67-7
C	0.2	7440-44-0
Al	0.2	7429-90-5

RN 477780-93-1 HCA
CN Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.4N0.6) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.6	17778-88-0
Zr	0.8	7440-67-7
C	0.4	7440-44-0
Al	0.2	7429-90-5

RN 477780-94-2 HCA
CN Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.6N0.4) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.4	17778-88-0
Zr	0.8	7440-67-7
C	0.6	7440-44-0
Al	0.2	7429-90-5

RN 477781-67-2 HCA
CN Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.7N0.3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.3	17778-88-0
Zr	0.8	7440-67-7
C	0.7	7440-44-0
Al	0.2	7429-90-5

CC 57-2 (Ceramics)
Section cross-reference(s): 55
ST aluminum zirconium carbonitride **epitaxial film** laser ablation deposition property; zirconium carbonitride **epitaxial film** laser ablation deposition property
IT Vapor deposition process
(laser ablation; pulsed reactive crossed-beam laser ablation deposition and properties of Zr carbonitride and Al Zr carbonitride **epitaxial films**)
IT Friction
Hardness (mechanical)
(pulsed reactive crossed-beam laser ablation deposition and properties of Zr carbonitride and Al Zr carbonitride **epitaxial films**)
IT **Epitaxial films**
(zirconium carbonitride and aluminum zirconium carbonitride; pulsed reactive crossed-beam laser ablation deposition and properties of Zr carbonitride and Al Zr carbonitride **epitaxial films**)
IT 12070-14-3P, Zirconium carbide (ZrC) 25658-42-8P, Zirconium nitride (ZrN) 107499-96-7P, Zirconium carbide nitride (ZrC0.9N0.1) 120150-26-7P, Zirconium carbide nitride (ZrC0.6N0.4) 149629-22-1P, Zirconium carbide nitride (ZrC0.7N0.3) 477780-88-4P, Zirconium carbide nitride (ZrC0.2N0.8) 477780-89-5P, Zirconium carbide nitride (ZrC0.4N0.6) 477780-90-8P, Aluminum zirconium nitride (Al0.2Zr0.8N) **477780-91-9P**, Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.1N0.9) **477780-92-0P**, Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.2N0.8) **477780-93-1P**, Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.4N0.6) **477780-94-2P**, Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.6N0.4) 477780-95-3P, Aluminum zirconium carbide (Al0.2Zr0.8C) **477781-67-2P**, Aluminum zirconium carbide nitride (Al0.2Zr0.8C0.7N0.3)
(**films**; pulsed reactive crossed-beam laser ablation deposition and properties of Zr carbonitride and Al Zr carbonitride **epitaxial films**)
IT 1309-48-4, Magnesium oxide (MgO), uses 12597-68-1, Stainless steel, uses
(substrate; pulsed reactive crossed-beam laser ablation deposition and properties of Zr carbonitride and Al Zr carbonitride **epitaxial films**)

L39 ANSWER 5 OF 13 HCA COPYRIGHT 2003 ACS
138:9793 Growth of SiCAlN on Si(111) via a crystalline oxide interface. Tolle, John; Roucka, R.; Crozier, P. A.; Chizmeshya, A. V. G.; Tsong, I. S. T.; Kouvetakis, J. (Arizona State University, Tempe, AZ, 85287, USA). Applied Physics Letters, 81(12), 2181-2183 (English) 2002. CODEN: APPLAB. ISSN: 0003-6951. Publisher: American Institute of Physics.
AB Growth of single-phase SiCAlN **epitaxial films** with the 2H-wurtzite structure is conducted directly on Si(111)

despite the structural differences and large lattice mismatch (19%) between the two materials. Commensurate heteroepitaxy is facilitated by the conversion of native and thermally grown SiO2 **layers** on Si(111) into cryst. oxides by in situ reactions of the **layers** with Al atoms and the H3SiCN precursor, forming coherent interfaces with the Si substrate and the **film**. High-resoln. TEM and EELS show that the amorphous SiO2 **films** are entirely transformed into a cryst. Si-Al-O-N framework in registry with the Si(111) surface. This cryst. interface acts as a template for nucleation and growth of **epitaxial** SiCAlN. Integration of wide-band-gap semiconductors with Si is readily achieved by this process.

IT **224784-20-7**, Aluminum silicon nitride oxide (al18si12n8o39)
461390-90-9, Aluminum silicon nitride oxide (al6si3n2o12)
(cryst. interface as template for nucleation and growth of **epitaxial** SiCAlN **films** on SiO2 **layers** on Si(111))

RN 224784-20-7 HCA

CN Aluminum silicon nitride oxide (Al18Si12N8O39) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	8	17778-88-0
O	39	17778-80-2
Si	12	7440-21-3
Al	18	7429-90-5

RN 461390-90-9 HCA

CN Aluminum silicon nitride oxide (Al6Si3N2O12) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	2	17778-88-0
O	12	17778-80-2
Si	3	7440-21-3
Al	6	7429-90-5

IT **143384-60-5**, Aluminum silicon carbide nitride (AlSiCN)
(cryst. interface as template for nucleation and growth of **epitaxial** SiCAlN **films** on SiO2 **layers** on Si(111))

RN 143384-60-5 HCA

CN Aluminum silicon carbide nitride (AlSiCN) (9CI) (CA INDEX NAME)

Si

N Al C

IT **1111-70-2**, Cyanosilane
(growth of SiCAlN **epitaxial films** on Si(111) via cryst. oxide interface by in situ reactions of SiO2 **layers** with Al atoms and H3SiCN precursor)
RN 1111-70-2 HCA
CN Silanecarbonitrile (7CI, 8CI, 9CI) (CA INDEX NAME)

$H_3Si-C\equiv N$

CC 75-1 (Crystallography and Liquid Crystals)
IT Crystal nucleation
Epitaxy
(cryst. interface as template for nucleation and growth of **epitaxial** SiCAlN **films** on SiO2 **layers** on Si(111))
IT **Epitaxial films**
Interface
(growth of SiCAlN **epitaxial films** on Si(111) via cryst. oxide interface by in situ reactions of SiO2 **layers** with Al atoms and H3SiCN precursor)
IT **224784-20-7**, Aluminum silicon nitride oxide (al18si12n8o39)
461390-90-9, Aluminum silicon nitride oxide (al6si3n2o12)
(cryst. interface as template for nucleation and growth of **epitaxial** SiCAlN **films** on SiO2 **layers** on Si(111))
IT **143384-60-5**, Aluminum silicon carbide nitride (AlSiCN)
(cryst. interface as template for nucleation and growth of **epitaxial** SiCAlN **films** on SiO2 **layers** on Si(111))
IT 7631-86-9, Silica, processes
(growth of SiCAlN **epitaxial films** on Si(111) via cryst. oxide interface by in situ reactions of SiO2 **layers** with Al atoms and H3SiCN precursor)
IT **1111-70-2**, Cyanosilane 7429-90-5, Aluminum, reactions
(growth of SiCAlN **epitaxial films** on Si(111) via cryst. oxide interface by in situ reactions of SiO2 **layers** with Al atoms and H3SiCN precursor)

L39 ANSWER 6 OF 13 HCA COPYRIGHT 2003 ACS
137:132947 Growth of **epitaxial** (SiC)x(AlN)1-x thin **films** on 6H-SiC by ion-assisted dual magnetron sputter deposition. Tungasmita, S.; Persson, P. O. A.; Seppanen, T.; Hultman, L.; Birch, J. (Thin Film Physics Division, Linkoping University, Linkoping, SE-581 83, Swed.). Materials Science Forum, 389-393(Pt. 2, Silicon Carbide and Related Materials, Part 2), 1481-1484 (English) 2002. CODEN: MSFOEP. ISSN: 0255-5476. Publisher: Trans Tech Publications Ltd..
AB (SiC)x(AlN)1-x thin **films** were grown **epitaxially** on vicinal 6H-SiC (0001) by low-energy ion assisted dual magnetron sputtering in UHV conditions. AES showed a decreasing Si and C content for an increasing magnetron power ratio, (PAl/PSiC). The

epitaxial quality of the **films** was improved as the SiC fraction increased. **Films** contg. <5% of Si and C show an evolution of domain width similar to the growth of pure AlN. HRXRD show a decreased c-axis lattice parameter for a **film** of AlNCx (0.ltoreq.x.ltoreq.0.1), indicating C substitution in AlN. CL spectra show defect-related peaks of .apprx.3.87 and .apprx.4.70 eV, corresponding to O and C impurities resp. as well as on un-identified peak at .apprx.3.40 eV.

IT **128515-74-2P**, Aluminum silicon carbide nitride (Al0.7Si0.3C0.3N0.7) **136479-15-7P**, Aluminum silicon carbide nitride (Al0.6Si0.4C0.4N0.6)
(growth of **epitaxial** silicon carbide thin **films** on 6H-silicon carbide by ion-assisted dual magnetron sputter deposition)

RN 128515-74-2 HCA
CN Aluminum silicon carbide nitride (Al0.7Si0.3C0.3N0.7) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.7	17778-88-0
C	0.3	7440-44-0
Si	0.3	7440-21-3
Al	0.7	7429-90-5

RN 136479-15-7 HCA
CN Aluminum silicon carbide nitride (Al0.6Si0.4C0.4N0.6) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.6	17778-88-0
C	0.4	7440-44-0
Si	0.4	7440-21-3
Al	0.6	7429-90-5

CC 76-11 (Electric Phenomena)
Section cross-reference(s): 75
ST magnetron sputter **epitaxy** aluminum nitride silicon carbide
IT Cathodoluminescence
Magnetron sputtering
Reactive sputtering
(growth of **epitaxial** silicon carbide thin **films** on 6H-silicon carbide by ion-assisted dual magnetron sputter deposition)
IT **Epitaxy**
(sputter; growth of **epitaxial** silicon carbide thin **films** on 6H-silicon carbide by ion-assisted dual magnetron sputter deposition)
IT 7429-90-5, Aluminum, processes 7727-37-9, Nitrogen, processes

(growth of **epitaxial** silicon carbide thin **films** on 6H-silicon carbide by ion-assisted dual magnetron sputter deposition)

IT 409-21-2, Silicon carbide (SiC), processes
(growth of **epitaxial** silicon carbide thin **films** on 6H-silicon carbide by ion-assisted dual magnetron sputter deposition)

IT **128515-74-2P**, Aluminum silicon carbide nitride (Al0.7Si0.3C0.3N0.7) **136479-15-7P**, Aluminum silicon carbide nitride (Al0.6Si0.4C0.4N0.6) 444056-77-3P, Aluminum carbide nitride (AlC0.04N)
(growth of **epitaxial** silicon carbide thin **films** on 6H-silicon carbide by ion-assisted dual magnetron sputter deposition)

L39 ANSWER 7 OF 13 HCA COPYRIGHT 2003 ACS

136:361965 Low-temperature growth of SiCAlN **films** of high hardness on Si(111) substrates. Roucka, Radek; Tolle, John; Smith, David J.; Crozier, Peter; Tsong, I. S. T.; Kouvetakis, John (Arizona State University, Tempe, AZ, 85287, USA). Applied Physics Letters, 79(18), 2880-2882 (English) 2001. CODEN: APPLAB. ISSN: 0003-6951. Publisher: American Institute of Physics.

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QC1 A745

29 Oct 2001

AB Thin **films** of metastable SiCAlN solid soln. were deposited on Si(111) substrates at 550-750.degree., considerably below the miscibility gap of SiC and AlN phases at 1900.degree.. The low-temp. growth was based upon thermally activated reactions between a unimol. precursor H3SiCN and Al atoms from an evaporative cell in a mol.-beam-**epitaxy** chamber. Characterization of deposited **films** by spectroscopic and microscopic techniques yielded near-stoichiometric compn. throughout the columnar wurtzite structure with lattice parameters very close to those of 2H-SiC and hexagonal AlN. An av. hardness of 25 GPa was measured for the SiCAlN **films**, comparable to that measured for sapphire.

IT **111409-04-2**, Aluminum silicon carbide nitride
(gas-source MBE of SiC-AlN solid soln. **films** with 2H-wurtzite structure on Si (111) substrates with high hardness)

RN 111409-04-2 HCA

CN Aluminum carbide nitride silicide (Al0-1(C,N,Si)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0 - 1	17778-88-0
C	0 - 1	7440-44-0
Si	0 - 1	7440-21-3
Al	0 - 1	7429-90-5

IT **1111-70-2**, Silyl cyanide
(reaction with aluminum in gas-source MBE of SiC-AlN solid soln. **films** on Si (111) substrates with high hardness)

RN 1111-70-2 HCA
CN Silanecarbonitrile (7CI, 8CI, 9CI) (CA INDEX NAME)

H_3Si C N

CC 75-1 (Crystallography and Liquid Crystals)
IT Hardness (mechanical)
Molecular beam **epitaxy**
(gas-source MBE of SiC-AlN solid soln. **films** on Si (111) substrates with high hardness)
IT Crystal structure
IR spectra
(of SiC-AlN solid soln. **films** grown by gas-source MBE on Si (111) substrates)
IT **111409-04-2**, Aluminum silicon carbide nitride
(gas-source MBE of SiC-AlN solid soln. **films** with 2H-wurtzite structure on Si (111) substrates with high hardness)
IT **1111-70-2**, Silyl cyanide
(reaction with aluminum in gas-source MBE of SiC-AlN solid soln. **films** on Si (111) substrates with high hardness)
IT 7429-90-5, Aluminum, processes
(reaction with silyl cyanide in gas-source MBE of SiC-AlN solid soln. **films** on Si (111) substrates with high hardness)

L39 ANSWER 8 OF 13 HCA COPYRIGHT 2003 ACS
133:244917 Method for fabricating optoelectronic device in low-temperature deposition and thermal treatment. Shim, Kyu Hwan; Paek, Mun Cheol; Cho, Kyoung Ik (Electronics and Telecommunications Research Institute, S. Korea). U.S. US 6124147 A 20000926, 9 pp. (English). CODEN: USXXAM. APPLICATION: US 1998-195691 19981119. PRIORITY: KR 1998-38422 19980917.
AB The present invention relates to a semiconductor device and, more particularly, to a short-wavelength optoelectronic device and a method for fabricating the same. The optoelectronic device according to the present invention does not have to employ an ion implantation process and an ohmic contact to make the n-p junction in the WB compd. semiconductor, providing a sufficient efficiency for display. The method according to the present invention comprises the step of (a) forming a SiC:AlN superlattice multilayer by alternately forming a SiC **epitaxial film** and an AlN **epitaxial film** on a substrate, wherein the AlN **film** is formed and the SiC **film** is formed using a single source gas of 1,3-disilabutane in an N plasma-assisted metalorg. MBE system; and (b) applying a thermal treatment to the SiC:AlN super lattice multilayer, thereby a mixed crystal compd. having (SiC)x(AlN)1-x quantum wells obtained by a diffusion of SiC **film** and AlN.
IT **111409-04-2P**, Aluminum silicon carbide nitride (Al0-1Si0-1C0-1N0-1)
(fabricating optoelectronic device with)
RN 111409-04-2 HCA

CN Aluminum carbide nitride silicide (Al0-1(C,N,Si)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0 - 1	17778-88-0
C	0 - 1	7440-44-0
Si	0 - 1	7440-21-3
Al	0 - 1	7429-90-5

IC ICM H01L021-00
NCL 438046000
CC 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 74, 75, 76
IT Diffusion
Epitaxy
Heat treatment
(fabricating optoelectronic device by)
IT Metalorganic molecular beam **epitaxy**
(fabricating optoelectronic device by plasma OMBE of silicon carbide)
IT 409-21-2P, Silicon carbide (SiC), uses 24304-00-5P, Aluminum nitride (AlN) **111409-04-2P**, Aluminum silicon carbide nitride (Al0-1Si0-1C0-1N0-1)
(fabricating optoelectronic device with)

L39 ANSWER 9 OF 13 HCA COPYRIGHT 2003 ACS
132:144540 Aluminum titanium nitride **films** grown with multiple precursors. Sun, Y.-M.; Endle, J. P.; Ekerdt, J. G.; Russell, N. M.; Healy, M. D.; White, J. M. (Department of Chemistry and Biochemistry, The University of Texas at Austin, Austin, TX, 78712, USA). Materials Science in Semiconductor Processing, 2(3), 253-261 (English) 1999. CODEN: MSSPFQ. ISSN: 1369-8001. Publisher: Elsevier Science Ltd..

AB Metalorg. CVD (MOCVD) of AlxTi1-xN **films** was studied at 200 to 400.degree. using tetrakis(dimethylamino)titanium (TDMAT), dimethylaluminum hydride (DMAH), triethylaluminum (TEA) and dimethylhydrazine (DMH). The **film** compn. was examd. by in-situ XPS. AlxTi1-xN and AlxTi1-xCN (CN designate to carbo-nitride) **film** growth was obsd. on SiO2/Si(100) using various combinations of above precursors. With TDMAT and either Al precursor, the metal to C to N ratio is approx. const. at 1:1:1 for most conditions studied. Introducing DMH significantly lowers the C concn. from .apprx.33 to .apprx.10% and increases the N content from 33 to >50%. The chem. states of Ti, C and N in AlxTi1-xCN and AlxTi1-xN **films** are not identical. The Al chem. state in AlxTi1-xCN **films** is nitride at low Al concn., but increasingly more carbidic at high Al concn. The Al content in the **film** is controlled by the ratio of partial pressures of the Al and Ti precursors in the gas phase. Using triethylaluminum (TEA)

instead of DMAH does not introduce extra C into the **film**. A higher flow rate of TEA is needed, compared to that for DMAH, for the same Al/Ti ratio in the **film**. Finally, the step **coverage** of **films** grown at various temps. was examd.

IT **3275-24-9**, Tetrakis(dimethylamino)titanium
(metalorg. CVD of aluminum titanium nitride and aluminum titanium carbonitride **films** using multiple precursors)

RN 3275-24-9 HCA

CN Methanamine, N-methyl-, titanium(4+) salt (9CI) (CA INDEX NAME)

H_3C NH CH_3

● 1/4 Ti(IV)

IT **152761-79-0**, Aluminum titanium carbide nitride **212971-37-4**, Aluminum titanium carbide nitride (Al0.11Ti0.25C0.33N0.31) **212971-38-5**, Aluminum titanium carbide nitride (Al0.05Ti0.31C0.32N0.31) **212971-39-6**, Aluminum titanium carbide nitride (Al0.03Ti0.32C0.33N0.32) **212971-42-1**, Aluminum titanium carbide nitride (Al0.17Ti0.19C0.35N0.29) **212971-45-4**, Aluminum titanium carbide nitride (Al0.26Ti0.11C0.43N0.2) **256495-59-7**, Aluminum titanium carbide nitride (Al0.12Ti0.24C0.11N0.53) **256495-60-0**, Aluminum titanium carbide nitride (Al0.08Ti0.21C0.37N0.34) **256495-61-1**, Aluminum titanium carbide nitride (Al0.08Ti0.23C0.37N0.32)
(metalorg. CVD of aluminum titanium nitride **films** using multiple precursors)

RN 152761-79-0 HCA

CN Aluminum titanium carbide nitride (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	x	17778-88-0
C	x	7440-44-0
Ti	x	7440-32-6
Al	x	7429-90-5

RN 212971-37-4 HCA

CN Aluminum titanium carbide nitride (Al0.11Ti0.25C0.33N0.31) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.31	17778-88-0

C	0.33	7440-44-0
Ti	0.25	7440-32-6
Al	0.11	7429-90-5

RN 212971-38-5 HCA
CN Aluminum titanium carbide nitride (Al0.05Ti0.31C0.32N0.31) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.31	17778-88-0
C	0.32	7440-44-0
Ti	0.31	7440-32-6
Al	0.05	7429-90-5

RN 212971-39-6 HCA
CN Aluminum titanium carbide nitride (Al0.03Ti0.32C0.33N0.32) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.32	17778-88-0
C	0.33	7440-44-0
Ti	0.32	7440-32-6
Al	0.03	7429-90-5

RN 212971-42-1 HCA
CN Aluminum titanium carbide nitride (Al0.17Ti0.19C0.35N0.29) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.29	17778-88-0
C	0.35	7440-44-0
Ti	0.19	7440-32-6
Al	0.17	7429-90-5

RN 212971-45-4 HCA
CN Aluminum titanium carbide nitride (Al0.26Ti0.11C0.43N0.2) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.2	17778-88-0
C	0.43	7440-44-0
Ti	0.11	7440-32-6
Al	0.26	7429-90-5

RN 256495-59-7 HCA
CN Aluminum titanium carbide nitride (Al0.12Ti0.24C0.11N0.53) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.53	17778-88-0
C	0.11	7440-44-0
Ti	0.24	7440-32-6
Al	0.12	7429-90-5

RN 256495-60-0 HCA
CN Aluminum titanium carbide nitride (Al0.08Ti0.21C0.37N0.34) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.34	17778-88-0
C	0.37	7440-44-0
Ti	0.21	7440-32-6
Al	0.08	7429-90-5

RN 256495-61-1 HCA
CN Aluminum titanium carbide nitride (Al0.08Ti0.23C0.37N0.32) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.32	17778-88-0
C	0.37	7440-44-0
Ti	0.23	7440-32-6
Al	0.08	7429-90-5

CC 75-1 (Crystallography and Liquid Crystals)
ST metalorg CVD aluminum titanium nitride **film** multiple
precursor
IT Vapor deposition process
(metalorg.; metalorg. CVD of aluminum titanium nitride and
aluminum titanium carbonitride **films** using multiple
precursors)
IT X-ray photoelectron spectra
(of aluminum titanium nitride and aluminum titanium carbonitride
films grown by metalorg. CVD using multiple precursors)
IT 97-93-8, Triethylaluminum, reactions 865-37-2, Dimethylaluminum
hydride **3275-24-9**, Tetrakis(dimethylamino)titanium
30260-66-3, Dimethylhydrazine
(metalorg. CVD of aluminum titanium nitride and aluminum titanium
carbonitride **films** using multiple precursors)
IT **152761-79-0**, Aluminum titanium carbide nitride

212971-37-4, Aluminum titanium carbide nitride (Al0.11Ti0.25C0.33N0.31) **212971-38-5**, Aluminum titanium carbide nitride (Al0.05Ti0.31C0.32N0.31) **212971-39-6**, Aluminum titanium carbide nitride (Al0.03Ti0.32C0.33N0.32) **212971-42-1**, Aluminum titanium carbide nitride (Al0.17Ti0.19C0.35N0.29) **212971-45-4**, Aluminum titanium carbide nitride (Al0.26Ti0.11C0.43N0.2) **256495-59-7**, Aluminum titanium carbide nitride (Al0.12Ti0.24C0.11N0.53) **256495-60-0**, Aluminum titanium carbide nitride (Al0.08Ti0.21C0.37N0.34) **256495-61-1**, Aluminum titanium carbide nitride (Al0.08Ti0.23C0.37N0.32)
(metalorg. CVD of aluminum titanium nitride **films** using multiple precursors)

L39 ANSWER 10 OF 13 HCA COPYRIGHT 2003 ACS
129:305481 Boron-containing carbosilanes, boron-containing carbosilazanes, and boron silicon carbide nitride ceramics, their manufacture, and use of the boron-containing carbosilazanes. Eiling, Aloys; Riedel, Ralf; Ruwisch, Lutz (Bayer Aktiengesellschaft, Germany). PCT Int. Appl. WO 9845303 A1 19981015, 27 pp. DESIGNATED STATES: W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (German). CODEN: PIXXD2. APPLICATION: WO 1998-EP1671 19980323. PRIORITY: DE 1997-19713767 19970403.

GI

R^1

R^2 – B (R')$_n$

R^3 I

AB The B-contg. carbosilanes have general formula I {R1 = HC(R4)Si(R5)(R6)R7, C(R4)2CH(CR4)C(R4)2Si(R5)(R6)R7, or C(R4)[CH(R4)2]C(R4)2Si(R5)(R6)R7; R4 = H, C1-3-alkyl and/or Ph; R5 = Cl, Br; independently, R6, R7 = Cl, Br, H, C1-3-alkyl and/or Ph; R2 = R1 or Cl, Br; R3 = R5; R' = SMe2, NMe2H; n = 0 for R2 = R1; n =1 for R2 = R5}. The I is manufd. by reacting .gtoreq.1 haloalkanesilanes having general formula R5Si(R6)(R7)[C(R4)2]mC(R4):C(R4)2 (II) (R4-7 as above; m = 0 or 1) with boranes having general formula HxBR53-xSMe2 or H2-xBR5xNHMe2 (x = 2 or 1) in inert gas in an aprotic solvent at <20.degree., in which the II/boranes ratio is detd. by x. The B-contg. carbosilanes

may have general formula (R1)2BNHR8 (III) {R1, R4-7 as above; R8 = SiR9 [R9 = C1-3-alkyl, Cl, or B(R1)2, B(R5)2, or B(R1)(R5)]}. The III (R8 = SiR9; R9 = C1-3-alkyl or Cl) is manufd. by reacting I (R2 = R1; R6, R7 as above) with Me3SiNHSiCl3 at <70.degree.. The III may be further reacted with BR53 (R5 as above), BR52R1, or BR5(R1)2. The B-contg. carbosilazanes are obtained by reacting the B-contg. carbosilanes with NH3 and/or primary or secondary C1-3-alkylamine. The B-Si carbide nitrides are manufd. by pyrolyzing .gtoreq.1 of the above carbosilazanes in NH3 or inert gas at 25-2000.degree.. Trichlorovinylsilane 36 was reacted at 10.degree. with dimethylsulfidemonochloroborane 14.6 in PhMe 50 A to give bis[(trichlorosilyl)ethyl]chloroborane (IV) 35.3 mL. Hexamethyldisilazane 3.04 was reacted at 0.degree. with IV 13.88 to give bis{bis[(tichlorosilyl)ethyl]boryl}amine 12.9 g.

IT **137753-05-0P**, Boron carbide nitride silicide
(manuf. of; by pyrolyzing boron-contg. carbosilazanes in ammonia or inert gas)

RN 137753-05-0 HCA

CN Boron carbide nitride silicide (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	x	17778-88-0
C	x	7440-44-0
B	x	7440-42-8
Si	x	7440-21-3

IT **999-97-3**
(reaction of; with bis[(trichlorosilyl)ethyl]chloroborane, for bis{bis[(trichlorosilyl)ethyl]boryl}amine for pyrolysis to silicon carbide nitride ceramics)

RN 999-97-3 HCA

CN Silanamine, 1,1,1-trimethyl-N-(trimethylsilyl)- (9CI) (CA INDEX NAME)

Me_3Si NH $SiMe_3$

IC ICM C07F007-12
ICS C07F007-08; C04B035-571; D01F009-10

CC 57-2 (Ceramics)

ST boron carbosilane carbosilazane pyrolysis; ceramic boron carbosilazane pyrolysis; silicon boron carbide nitride ceramic; powder fiber **coating** ceramic

IT **137753-05-0P**, Boron carbide nitride silicide
(manuf. of; by pyrolyzing boron-contg. carbosilazanes in ammonia or inert gas)

IT **999-97-3**
(reaction of; with bis[(trichlorosilyl)ethyl]chloroborane, for bis{bis[(trichlorosilyl)ethyl]boryl}amine for pyrolysis to silicon carbide nitride ceramics)

L39 ANSWER 11 OF 13 HCA COPYRIGHT 2003 ACS
129:237800 Low pressure CVD growth of AlxTi1-xN **films** with tetrakis(dimethylamido)titanium (TDMAT) and dimethylaluminum hydride (DMAH) precursors. Sun, Y.-M.; Endle, J.; Ekerdt, J. G.; Russell, N. M.; Healy, M. D.; White, J. M. (Department of Chemistry and Biochemistry, Department of Chemical Engineering, The University of Texas at Austin, Austin, TX, 78712, USA). Materials Research Society Symposium Proceedings, 495(Chemical Aspects of Electronic Ceramics Processing), 165-170 (English) 1998. CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.

AB AlxTi1-xN **film** growth was studied by a organometallic CVD and in-situ XPS. TDMAT and DMAH were used as the Ti, N and Al precursors. AlxTi1-xN **film** growth was obsd. on SiO2/Si(100) with substrate temps. between 200 and 400.degree.. The Al content in the **film** is controlled by the ratio of partial pressures of the two precursors in the gas phase. The metal to C to N ratio is approx. const. at 1:1:1 for most conditions studied. The chem. states of Ti, C, and N in AlxTi1-xN and Ti-carbonitride (TiCN) **films** are identical, while the Al chem. state is nitride at low, but increasingly carbidic at high Al concn. The initial growth rate on SiO2 was significantly suppressed by the presence of DMAH. At lower growth temps., the DMAH effect is more severe. Good step **coverage** was obsd. for AlxTi1-xN on 0.3 pm vias with a 3:1 aspect ratio.

IT **3275-24-9**, Tetrakis(dimethylamido)titanium
212971-37-4, Aluminum titanium carbide nitride (Al0.11Ti0.25C0.33N0.31) **212971-38-5**, Aluminum titanium carbide nitride (Al0.05Ti0.31C0.32N0.31) **212971-39-6**, Aluminum titanium carbide nitride (Al0.03Ti0.32C0.33N0.32) **212971-41-0**, Aluminum titanium carbide nitride (Al0.24Ti0.12C0.42N0.21) **212971-42-1**, Aluminum titanium carbide nitride (Al0.17Ti0.19C0.35N0.29) **212971-43-2**, Aluminum titanium carbide nitride (Al0.06Ti0.28C0.34N0.31) **212971-45-4**, Aluminum titanium carbide nitride (Al0.26Ti0.11C0.43N0.2) **212971-46-5**, Aluminum titanium carbide nitride (Al0.11Ti0.23C0.33N0.32) **212971-47-6**, Aluminum titanium carbide nitride (Al0.05Ti0.28C0.34N0.33)
(effect of tetrakis(dimethylamido)titanium/dimethylaluminum hydride precursor ratios on compn. and properties of aluminum titanium carbide nitride **films** grown by low pressure CVD)

RN 3275-24-9 HCA
CN Methanamine, N-methyl-, titanium(4+) salt (9CI) (CA INDEX NAME)

$H_3C-NH-CH_3$

● 1/4 Ti(IV)

RN 212971-37-4 HCA
CN Aluminum titanium carbide nitride (Al0.11Ti0.25C0.33N0.31) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.31	17778-88-0
C	0.33	7440-44-0
Ti	0.25	7440-32-6
Al	0.11	7429-90-5

RN 212971-38-5 HCA
CN Aluminum titanium carbide nitride (Al0.05Ti0.31C0.32N0.31) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.31	17778-88-0
C	0.32	7440-44-0
Ti	0.31	7440-32-6
Al	0.05	7429-90-5

RN 212971-39-6 HCA
CN Aluminum titanium carbide nitride (Al0.03Ti0.32C0.33N0.32) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.32	17778-88-0
C	0.33	7440-44-0
Ti	0.32	7440-32-6
Al	0.03	7429-90-5

RN 212971-41-0 HCA
CN Aluminum titanium carbide nitride (Al0.24Ti0.12C0.42N0.21) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.21	17778-88-0
C	0.42	7440-44-0
Ti	0.12	7440-32-6
Al	0.24	7429-90-5

RN 212971-42-1 HCA
CN Aluminum titanium carbide nitride (Al0.17Ti0.19C0.35N0.29) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.29	17778-88-0
C	0.35	7440-44-0
Ti	0.19	7440-32-6
Al	0.17	7429-90-5

RN 212971-43-2 HCA
CN Aluminum titanium carbide nitride ($Al_{0.06}Ti_{0.28}C_{0.34}N_{0.31}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.31	17778-88-0
C	0.34	7440-44-0
Ti	0.28	7440-32-6
Al	0.06	7429-90-5

RN 212971-45-4 HCA
CN Aluminum titanium carbide nitride ($Al_{0.26}Ti_{0.11}C_{0.43}N_{0.2}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.2	17778-88-0
C	0.43	7440-44-0
Ti	0.11	7440-32-6
Al	0.26	7429-90-5

RN 212971-46-5 HCA
CN Aluminum titanium carbide nitride ($Al_{0.11}Ti_{0.23}C_{0.33}N_{0.32}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.32	17778-88-0
C	0.33	7440-44-0
Ti	0.23	7440-32-6
Al	0.11	7429-90-5

RN 212971-47-6 HCA
CN Aluminum titanium carbide nitride ($Al_{0.05}Ti_{0.28}C_{0.34}N_{0.33}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number

N	0.33	17778-88-0
C	0.34	7440-44-0
Ti	0.28	7440-32-6
Al	0.05	7429-90-5

CC 75-1 (Crystallography and Liquid Crystals)
IT Vapor deposition process
(chem.; effect of tetrakis(dimethylamido)titanium/dimethylaluminum hydride precursor ratios on compn. and properties of aluminum titanium carbide nitride **films** grown by low pressure CVD)
IT 865-37-2, Dimethylaluminum hydride **3275-24-9**, Tetrakis(dimethylamido)titanium **212971-37-4**, Aluminum titanium carbide nitride (Al0.11Ti0.25C0.33N0.31) **212971-38-5**, Aluminum titanium carbide nitride (Al0.05Ti0.31C0.32N0.31) **212971-39-6**, Aluminum titanium carbide nitride (Al0.03Ti0.32C0.33N0.32) 212971-40-9, Titanium carbide nitride (Ti0.35C0.31N0.34) **212971-41-0**, Aluminum titanium carbide nitride (Al0.24Ti0.12C0.43N0.21) **212971-42-1**, Aluminum titanium carbide nitride (Al0.17Ti0.19C0.35N0.29) **212971-43-2**, Aluminum titanium carbide nitride (Al0.06Ti0.28C0.34N0.31) 212971-44-3, Titanium carbide nitride (Ti0.34C0.32N0.33) **212971-45-4**, Aluminum titanium carbide nitride (Al0.26Ti0.11C0.43N0.2) **212971-46-5**, Aluminum titanium carbide nitride (Al0.11Ti0.23C0.33N0.32) **212971-47-6**, Aluminum titanium carbide nitride (Al0.05Ti0.28C0.34N0.33)
(effect of tetrakis(dimethylamido)titanium/dimethylaluminum hydride precursor ratios on compn. and properties of aluminum titanium carbide nitride **films** grown by low pressure CVD)

L39 ANSWER 12 OF 13 HCA COPYRIGHT 2003 ACS
127:165328 Crystal-oriented high-strength coated parts. Suzuki, Tetsuya; Fukano, Kenji; Kihata, Mamoru (Toshiba Tungaloy Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 09170068 A2 19970630 Heisei, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1995-348309 19951218.
AB The parts consist of a substrate (metal, alloy, or ceramic), a hard single or multi-layer coating of .gtoreq.1 kinds of Ti- and Al-contg. composite nitride, carbonitride, oxynitride, and oxycarbonitride, and an interlayer of .gtoreq.1 kinds of carbides and nitrides of group 4a, 5a, 6a elements, where the interface between substrate and the interlayer and/or the interface between the interlayer and the hard coating have a hetero-**epitaxial** relationship. The coatings have good spalling resistance, and are suitable for cutting tools, etc.
IT **152761-79-0**, Aluminum titanium carbide nitride
(coating; crystal-oriented high-strength coated parts)
RN 152761-79-0 HCA
CN Aluminum titanium carbide nitride (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	x	17778-88-0
C	x	7440-44-0
Ti	x	7440-32-6
Al	x	7429-90-5

IC ICM C23C014-06
ICS C30B029-10; C30B029-38; B23B027-14; C30B023-08
CC 56-6 (Nonferrous Metals and Alloys)
Section cross-reference(s): 57
IT **Coating materials**
Cutting tools
(crystal-oriented high-strength coated parts)
IT 113151-72-7, Aluminum titanium nitride **152761-79-0**, Aluminum titanium carbide nitride
(coating; crystal-oriented high-strength coated parts)

L39 ANSWER 13 OF 13 HCA COPYRIGHT 2003 ACS
126:270614 Method for production of **epitaxial layers** of (SiC)1-x(AlN)x solid solutions. Nurmagomedov, Sh. A.; Safaraliev, G. K.; Tairov, Yu. M.; Tsvetkov, V. F. (Dagestanskij Gosudarstvennyj Universitet Im.V.I.Lenina, USSR). U.S.S.R. SU 1297523 A1 19961010, 243 pp. From: Izobreteniya 1996, (28), 243. (Russian). CODEN: URXXAF. APPLICATION: SU 1985-3845275 19850117.
AB Title only translated.
IT **111409-04-2P**, Aluminum silicon carbide nitride (Al0-1Si0-1C0-1N0-1)
(**epitaxy** of aluminum nitride solid solns. with silicon carbide)
RN 111409-04-2 HCA
CN Aluminum carbide nitride silicide (Al0-1(C,N,Si)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0 - 1	17778-88-0
C	0 - 1	7440-44-0
Si	0 - 1	7440-21-3
Al	0 - 1	7429-90-5

IC ICM C30B023-02
CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 76
ST **epitaxy** aluminum nitride silicon carbide
IT **Epitaxy**
(**epitaxy** of aluminum nitride solid solns. with silicon carbide)
IT **111409-04-2P**, Aluminum silicon carbide nitride (Al0-1Si0-1C0-1N0-1)

(**epitaxy** of aluminum nitride solid solns. with silicon carbide)

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L40 ANSWER 1 OF 7 HCA COPYRIGHT 2003 ACS

134:288399 Investigation of the SiC/(SiC)1-x(AlN)x Heterostructures by the Method of Capacitance-Voltage Characteristics. Kurbanov, M. K.; Bilalov, B. A.; Nurmagomedov, Sh. A.; Safaraliev, G. K. (Dagestan State University, Makhachkala, Dagestan, 327025, Russia). Semiconductors (Translation of Fizika i Tekhnika Poluprovodnikov (Sankt-Peterburg)), 35(2), 209-211 (English) 2001. CODEN: SMICES. ISSN: 1063-7826. Publisher: MAIK Nauka/Interperiodica Publishing.

AB Using the method of measuring and analyzing the capacitance-voltage characteristics, the n-6H-SiC/p-(SiC)1 - x(AlN)x heterostructures obtained by sublimation epitaxy of the (SiC)1-x(AlN)x layers on the 6H-SiC substrates have abrupt heterojunctions .apprx.10-4 cm thick. The basic properties of heterostructures, which depend on the epilayer compn. and temp., were detd. from the capacitance-voltage characteristics.

IT **163675-68-1**, Aluminum silicon carbide nitride (Al0.13Si0.87C0.87N0.13) **207983-94-6**, Aluminum silicon carbide nitride (Al0.15Si0.85C0.85N0.15) **333351-06-7**, Aluminum silicon carbide nitride (Al0.46Si0.54C0.54N0.46)
(investigation of silicon carbide/aluminum silicon carbide nitride Heterostructures by Method of Capacitance-Voltage Characteristics)

RN 163675-68-1 HCA

CN Aluminum silicon carbide nitride (Al0.13Si0.87C0.87N0.13) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.13	17778-88-0
C	0.87	7440-44-0
Si	0.87	7440-21-3
Al	0.13	7429-90-5

RN 207983-94-6 HCA

CN Aluminum silicon carbide nitride (Al0.15Si0.85C0.85N0.15) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.15	17778-88-0
C	0.85	7440-44-0
Si	0.85	7440-21-3
Al	0.15	7429-90-5

RN 333351-06-7 HCA
CN Aluminum silicon carbide nitride (Al0.46Si0.54C0.54N0.46) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.46	17778-88-0
C	0.54	7440-44-0
Si	0.54	7440-21-3
Al	0.46	7429-90-5

CC 76-3 (Electric Phenomena)
IT Dielectric constant
Electric breakdown
Electric capacitance-potential relationship
Epitaxial films
Impact ionization
Semiconductor heterojunctions
Space charge
Work function
(investigation of silicon carbide/aluminum silicon carbide nitride Heterostructures by Method of Capacitance-Voltage Characteristics)
IT **163675-68-1**, Aluminum silicon carbide nitride (Al0.13Si0.87C0.87N0.13) **207983-94-6**, Aluminum silicon carbide nitride (Al0.15Si0.85C0.85N0.15) **333351-06-7**, Aluminum silicon carbide nitride (Al0.46Si0.54C0.54N0.46)
(investigation of silicon carbide/aluminum silicon carbide nitride Heterostructures by Method of Capacitance-Voltage Characteristics)

L40 ANSWER 2 OF 7 HCA COPYRIGHT 2003 ACS
134:63406 Transformation of luminescence centers in (SiC)0.95(AlN)0.05 **epitaxial layers** under laser irradiation.
Safaraliev, G. K.; Emirov, Yu. N.; Kurbanov, M. K.; Isabekova, T. I. (Dagestan State University, Dagestan, 367025, Russia). Inorganic Materials (Translation of Neorganicheskie Materialy), 36(10), 1018-1019 (English) 2000. CODEN: INOMAF. ISSN: 0020-1685. Publisher: MAIK Nauka/Interperiodica Publishing.
AB The effect of laser irradn. on the photoluminescence of (SiC)0.95(AlN)0.05 **epitaxial films** was studied. Irradn. was found to dislodge Al and N atoms from their substitutional sites, producing radiative donor-acceptor pairs AlSi-NC. The av. pair sepn. decreases with increasing irradn. time, as evidenced by the shift of the corresponding emission to higher energies.
IT **117931-18-7**, Aluminum silicon carbide nitride (Al0.05Si0.95C0.95N0.05)
(transformation of luminescence centers in (SiC)0.95(AlN)0.05 **epitaxial layers** under laser irradn.)
RN 117931-18-7 HCA

CN Aluminum silicon carbide nitride ($Al_{0.05}Si_{0.95}C_{0.95}N_{0.05}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.05	17778-88-0
C	0.95	7440-44-0
Si	0.95	7440-21-3
Al	0.05	7429-90-5

CC 73-5 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 75, 76

ST luminescence center aluminum nitride silicon carbide **epitaxial layer** irradn; photoluminescence aluminum nitride silicon carbide **epitaxial film**

IT **Epitaxial films**
Luminescence
(luminescence shifts in $(SiC)_{0.95}(AlN)_{0.05}$ **epitaxial films** under laser irradn. due to formation of donor-acceptor AlSi-NC pairs)

IT **117931-18-7**, Aluminum silicon carbide nitride ($Al_{0.05}Si_{0.95}C_{0.95}N_{0.05}$)
(transformation of luminescence centers in $(SiC)_{0.95}(AlN)_{0.05}$ **epitaxial layers** under laser irradn.)

L40 ANSWER 3 OF 7 HCA COPYRIGHT 2003 ACS

133:302828 Spectral Shift of Photoluminescence Bands of the $(SiC)_{1-x}(AlN)_x$ **Epitaxial Films** due to Laser Annealing.
Safaraliev, G. K.; Emirov, Yu. N.; Kurbanov, M. K.; Bilalov, B. A. (Dagestan State University, Makhachkala, 367025, Russia).
Semiconductors (Translation of Fizika i Tekhnika Poluprovodnikov (Sankt-Peterburg)), 34(8), 891-893 (English) 2000. CODEN: SMICES. ISSN: 1063-7826. Publisher: MAIK Nauka/Interperiodica Publishing.

AB The effect of laser annealing on the photoluminescence properties of $(SiC)_{1-x}(AlN)_x$ ($x = 0.03-0.17$) **epitaxial films** was studied. It was proposed that annealing causes the displacement of the Al and N atoms from their lattice sites and the formation of AlSi-NC donor-acceptor pairs acting as the luminescence centers. According to this model, the increase in the annealing time is accompanied by the formation of donor-acceptor pairs with the shortest interat. distances at the expense of assocns. of the distant defects and by a shift of the resp. photoluminescence band to the high-energy spectral region.

IT **135021-79-3**, Aluminum silicon carbide nitride ($Al_{0.07}Si_{0.93}C_{0.93}N_{0.07}$)
(spectral shift of photoluminescence bands of $(SiC)_{1-x}(AlN)_x$ **epitaxial films** due to laser annealing)

RN 135021-79-3 HCA

CN Aluminum silicon carbide nitride ($Al_{0.07}Si_{0.93}C_{0.93}N_{0.07}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.07	17778-88-0
C	0.93	7440-44-0
Si	0.93	7440-21-3
Al	0.07	7429-90-5

CC 73-5 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 76
ST photoluminescence aluminum nitrogen silicon carbide **epitaxial film** laser annealing; luminescence spectral shift **epitaxial film** laser annealing
IT **Epitaxial films**
Laser annealing
Luminescence
Surface defects
(spectral shift of photoluminescence bands of (SiC)1-x(AlN)x **epitaxial films** due to laser annealing)
IT 24304-00-5, Aluminum nitride
(spectral shift of photoluminescence bands of (SiC)1-x(AlN)x **epitaxial films** due to laser annealing)
IT **135021-79-3**, Aluminum silicon carbide nitride (Al0.07Si0.93C0.93N0.07)
(spectral shift of photoluminescence bands of (SiC)1-x(AlN)x **epitaxial films** due to laser annealing)
IT 409-21-2, Silicon carbide (SiC), properties
(substrate; spectral shift of photoluminescence bands of (SiC)1-x(AlN)x **epitaxial films** due to laser annealing)

L40 ANSWER 4 OF 7 HCA COPYRIGHT 2003 ACS
122:227073 Growth of pseudomorphic heterostructures and solid solutions in the AlN-SiC system by plasma-assisted, gas-source molecular beam epitaxy. Kern, R. S.; Tanaka, S.; Davis, R. F. (Department of Materials Science and Engineering, North Carolina State University, Raleigh, NC, 27695-7907, USA). Institute of Physics Conference Series, 137(Silicon Carbide and Related Materials), 389-92 (English) 1994. CODEN: IPCSEP. ISSN: 0951-3248.
AB Thin **epitaxial films** of SiC/AlN multilayers and (AlN)x(SiC)1-x solid solns. were grown by plasma-assisted, gas-source MBE between 1050-1300.degree. using the gas sources of Si2H6, C2H4 and N2 decompd. using a compact electron cyclotron resonance plasma source as well as solid Al evapd. from a std. effusion cell on vicinal .alpha.(6H)-SiC(0001) substrates. RHEED and high-resoln. TEM revealed monocryst. layers and pseudomorphic interfacial relations at the substrate/film and the film/film interfaces.
IT **146640-20-2**, Aluminum silicon carbide nitride (Al0.2Si0.8C0.8N0.2)

(MBE and TEM and RHEED characterization on silicon carbide of films of)

RN 146640-20-2 HCA

CN Aluminum silicon carbide nitride (Al0.2Si0.8C0.8N0.2) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.2	17778-88-0
C	0.8	7440-44-0
Si	0.8	7440-21-3
Al	0.2	7429-90-5

CC 75-1 (Crystallography and Liquid Crystals)

IT **146640-20-2**, Aluminum silicon carbide nitride (Al0.2Si0.8C0.8N0.2)
(MBE and TEM and RHEED characterization on silicon carbide of films of)

L40 ANSWER 5 OF 7 HCA COPYRIGHT 2003 ACS

118:158188 Liquid phase epitaxy of silicon carbide-aluminum nitride solid solutions. Dmitriev, V. A.; Elfimov, L. B.; Lin'kov, I. Yu.; Morozenko, Ya. V.; Nikitina, I. P.; Chelnokov, V. E.; Cherenkov, A. E.; Chernov, M. A. (A. F. Ioffe Phys.-Tech. Inst., St. Petersburg, 194021, Russia). Springer Proceedings in Physics, 71(Amorphous and Crystalline Silicon Carbide IV), 101-4 (English) 1992. CODEN: SPPPEL. ISSN: 0930-8989.

AB (SiC)1-x(AlN)x layers and p-n structures were grown by container free LPE. Auger measurements indicated that the concn. of the AlN component in the **epitaxial layers** are 2-10 percent, depending on the growth conditions. Element's distribution across the layer was uniform. X-ray difraction data indicated that layers are monocryst. Intense cathodoluminescence from the layers was recorded at 85 K. The short-wave wing of the luminescence spectrum extends up to 3.6 eV in energy. The cond. type of solid soln. depends on growth conditions. Using this dependence, (SiC)1-x(AlN)x solid soln. p-n junctions were fabricated . Also hetero p-n junction between n-type 6H-SiC substrate and p type solid soln. was made. Both p-n junctions have effective electroluminescence at room temp.

IT **146749-90-8**, Aluminum silicon carbide nitride (Al0.02-0.1Si0.9-0.98C0.9-0.98N0.02-0.1)
(**epitaxy** of **layers** and p-n structures of, liq.-phase)

RN 146749-90-8 HCA

CN Aluminum silicon carbide nitride (Al0.02-0.1Si0.9-0.98C0.9-0.98N0.02-0.1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number

N	0.02 - 0.1	17778-88-0
C	0.9 - 0.98	7440-44-0
Si	0.9 - 0.98	7440-21-3
Al	0.02 - 0.1	7429-90-5

CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 73, 76
IT **146749-90-8**, Aluminum silicon carbide nitride (Al0.02-0.1Si0.9-0.98C0.9-0.98N0.02-0.1)
(**epitaxy** of **layers** and p-n structures of, liq.-phase)

L40 ANSWER 6 OF 7 HCA COPYRIGHT 2003 ACS
111:123010 Optical absorption and luminescence of silicon carbide/aluminum nitride [(SiC)1-x(AlN)x] solid solutions. Nurmagomedov, Sh. A.; Pikhtin, A. N.; Razbegaev, V. N.; Safaraliev, G. K.; Tairov, Yu. M.; Tsvetkov, V. F. (Leningr. Elektrotekh. Inst., Leningrad, USSR). Fizika i Tekhnika Poluprovodnikov (Sankt-Peterburg), 23(1), 162-4 (Russian) 1989. CODEN: FTPPA4. ISSN: 0015-3222.
AB The quasi-binary wide-band solid solns. of SiC-AlN are of significant interest for creating optoelectronic devices operating in the blue and UV regions of the spectra. Data were sought both on the optical absorption and on the luminescence of such solid solns. to confirm the existence of a continuous series of solid solns. in this system. The **epitaxial layers** of (SiC)1-x(AlN)x were synthesized by the sandwich method in an atom. of an Ar-N mixt. The growth was accomplished on single-crystal substrates of .alpha.-Al2O3 and 6H-SiC. X-ray spectral microanal. confirmed that the samples are solid solns. of (SiC)1-x(AlN)x, while electron diffraction measurements showed the formation of a rare polytype modification, 2H-SiC. The shift in the spectra in the short-wave region with increase in AlN content serves as an indirect exptl. confirmation of the existence of solid solns. of (SiC)1-x(AlN)x. Data on the luminescent properties addnl. serve as a good qual. confirmation of the formation of these solid solns.
IT **111409-04-2**, Aluminum carbide nitride silicide (Al0-1(C,N,Si)) **117963-32-3**, Aluminum silicon carbide nitride (Al0.54Si0.46C0.46N0.54) **122483-42-5**, Aluminum silicon carbide nitride (Al0.79Si0.21C0.21N0.79) **122483-43-6**, Aluminum silicon carbide nitride (Al0.4Si0.6C0.6N0.4)
(optical absorption and luminescence of)
RN 111409-04-2 HCA
CN Aluminum carbide nitride silicide (Al0-1(C,N,Si)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0 - 1	17778-88-0
C	0 - 1	7440-44-0
Si	0 - 1	7440-21-3

Al	0 - 1	7429-90-5

RN 117963-32-3 HCA
CN Aluminum silicon carbide nitride ($Al_{0.54}Si_{0.46}C_{0.46}N_{0.54}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.54	17778-88-0
C	0.46	7440-44-0
Si	0.46	7440-21-3
Al	0.54	7429-90-5

RN 122483-42-5 HCA
CN Aluminum silicon carbide nitride ($Al_{0.79}Si_{0.21}C_{0.21}N_{0.79}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.79	17778-88-0
C	0.21	7440-44-0
Si	0.21	7440-21-3
Al	0.79	7429-90-5

RN 122483-43-6 HCA
CN Aluminum silicon carbide nitride ($Al_{0.4}Si_{0.6}C_{0.6}N_{0.4}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.4	17778-88-0
C	0.6	7440-44-0
Si	0.6	7440-21-3
Al	0.4	7429-90-5

CC 73-5 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
IT **111409-04-2**, Aluminum carbide nitride silicide ($Al_{0-1}(C,N,Si)$) **117963-32-3**, Aluminum silicon carbide nitride ($Al_{0.54}Si_{0.46}C_{0.46}N_{0.54}$) **122483-42-5**, Aluminum silicon carbide nitride ($Al_{0.79}Si_{0.21}C_{0.21}N_{0.79}$) **122483-43-6**, Aluminum silicon carbide nitride ($Al_{0.4}Si_{0.6}C_{0.6}N_{0.4}$)
(optical absorption and luminescence of)

L40 ANSWER 7 OF 7 HCA COPYRIGHT 2003 ACS
106:129501 Preparing **epitaxial layers** of the silicon carbide-aluminum nitride solid solutions.. Nurmagomedov, Sh. A.; Safaraliev, G. K.; Sorokin, N. D.; Tairov, Yu. M.; Tsvetkov, V. F. (Dagest. Gos. Univ., Makhachkala, USSR). Izvestiya Akademii Nauk

SSSR, Neorganicheskie Materialy, 22(10), 1672-4 (Russian) 1986.
CODEN: IVNMAW. ISSN: 0002-337X.

AB The VPE was studied of (SiC)1-x(AlN)x (0.10 .ltoreq.x .ltoreq.0.90) prepd. at Ar pressures .ltoreq.90 kPa or Ar pressures 10-90 kPa and N2 pressures 5-50 kPa at 2170-2370 K on 6H-SiC of (0001) orientation. At x .gtoreq.0.2, the layers are 2H-type. The layers are p-type at x .ltoreq.0.4 and n-type at 0.4 <x .ltoreq.0.95. Optimum growth conditions are given.

IT **107252-29-9**
(epitaxy and elec. cond. of, vapor-phase)

RN 107252-29-9 HCA

CN Aluminum silicon carbide nitride (Al0-0.95Si0.05-1C0.05-1N0-0.95) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0 - 0.95	17778-88-0
C	0.05 - 1	7440-44-0
Si	0.05 - 1	7440-21-3
Al	0 - 0.95	7429-90-5

CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 76

IT **107252-29-9**
(epitaxy and elec. cond. of, vapor-phase)

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L41 ANSWER 1 OF 7 HCA COPYRIGHT 2003 ACS

137:147890 Low-Temperature **Epitaxial** Growth of the Quaternary Wide Band Gap Semiconductor SiCAlN. Roucka, R.; Tolle, J.; Chizmeshya, A. V. G.; Crozier, P. A.; Poweleit, C. D.; Smith, D. J.; Tsong, I. S. T.; Kouvetakis, J. (Department of Physics and Astronomy, Arizona State University, Tempe, AZ, 85287, USA). Physical Review Letters, 88(20), 206102/1-206102/4 (English) 2002. CODEN: PRLTAO. ISSN: 0031-9007. Publisher: American Physical Society.

AB Two compds. SiC and AlN, normally insol. in each other .ltorsim.2000.degree., were synthesized as a single-phase solid-soln. thin **film** by MBE at 750.degree.. The growth of **epitaxial** (SiC)1-x(AlN)x **films** with hexagonal structure takes place on 6H-SiC(0001) substrates. Two structural models for the hexagonal SiCAlN **films** are constructed based on 1st-principles total-energy d. functional theory calcns., each showing agreement with the exptl. microstructures obsd. in cross-sectional TEM images. The predicted fundamental band gap is 3.2 eV for the stoichiometric SiCAlN **film**.

IT **111409-04-2**, Aluminum silicon carbide nitride
143384-60-5, Aluminum silicon carbide nitride (AlSiCN)
(microstructures and low-temp. MBE of aluminum silicon carbide

nitride wide band gap semiconductor **films** on
6H-SiC(0001) substrates)

RN 111409-04-2 HCA
CN Aluminum carbide nitride silicide (Al0-1(C,N,Si)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0 - 1	17778-88-0
C	0 - 1	7440-44-0
Si	0 - 1	7440-21-3
Al	0 - 1	7429-90-5

RN 143384-60-5 HCA
CN Aluminum silicon carbide nitride (AlSiCN) (9CI) (CA INDEX NAME)

Si

N Al C

CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 76
IT Band gap
Microstructure
Molecular beam **epitaxy**
(microstructures and low-temp. MBE of aluminum silicon carbide nitride wide band gap semiconductor **films** on 6H-SiC(0001) substrates)
IT **111409-04-2**, Aluminum silicon carbide nitride
143384-60-5, Aluminum silicon carbide nitride (AlSiCN)
(microstructures and low-temp. MBE of aluminum silicon carbide nitride wide band gap semiconductor **films** on 6H-SiC(0001) substrates)

L41 ANSWER 2 OF 7 HCA COPYRIGHT 2003 ACS
136:208416 (AlN)x(SiC)1-x buried **layers** implanted in 6H-SiC: a theoretical study of their optimized composition. Masri, P.; Rouhani Laridjani, M.; Pezoldt, J.; Yankov, R. A.; Skorupa, W.; Averous, M. (Groupe d'Etude des Semi-Conducteurs, CNRS-UMR 5650, Universite Montpellier II, Montpellier, 34095, Fr.). Applied Surface Science, 184(1-4), 383-386 (English) 2001. CODEN: ASUSEE. ISSN: 0169-4332. Publisher: Elsevier Science B.V..
AB In this work, we present a methodol. which enables to optimize the compn. x of (AlN)x(SiC)1-x buried **layers** implanted in 6H-SiC host material. Our approach is based on the elasticity theory of strained interfaces which successfully predicts the formation of stable phases induced by **epitaxial** strains as well as their compn. In the investigated system, the two parent materials of the (AlN)x(SiC)1-x solid soln. are AlN and SiC. The used elastic properties of these two host materials take account of

the specific implantation method as a perturbative method inducing local modifications into the SiC matrix. The optimization procedure involves fitting of two parameters assocd. with the (AlN)x(SiC)1-x/6H-SiC interface structure, namely (i) the elastic-const., d.-related parameter S and (ii) the geometric parameter nS. When these parameters fulfill continuity and inter-phase pseudomorphism conditions, resp., an optimal compn. is detd., in agreement with exptl. results.

IT **111409-04-2**, Aluminum silicon carbide nitride
(buried implantation **layer**; (AlN)x(SiC)1-x buried **layers** implanted in 6H-SiC: a theor. study of optimized compn.)

RN 111409-04-2 HCA

CN Aluminum carbide nitride silicide (Al0-1(C,N,Si)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0 - 1	17778-88-0
C	0 - 1	7440-44-0
Si	0 - 1	7440-21-3
Al	0 - 1	7429-90-5

CC 76-3 (Electric Phenomena)

IT Elasticity
Interfacial structure
Ion implantation
Strain
((AlN)x(SiC)1-x buried **layers** implanted in 6H-SiC: a theor. study of optimized compn.)

IT Optimization
(compn. of (AlN)x(SiC)1-x buried **layers**; (AlN)x(SiC)1-x buried **layers** implanted in 6H-SiC: a theor. study of optimized compn.)

IT Solid-solid interface
(strained; (AlN)x(SiC)1-x buried **layers** implanted in 6H-SiC: a theor. study of optimized compn.)

IT **111409-04-2**, Aluminum silicon carbide nitride
(buried implantation **layer**; (AlN)x(SiC)1-x buried **layers** implanted in 6H-SiC: a theor. study of optimized compn.)

IT 409-21-2, Silicon carbide (SiC), properties
(substrate; (AlN)x(SiC)1-x buried **layers** implanted in 6H-SiC: a theor. study of optimized compn.)

L41 ANSWER 3 OF 7 HCA COPYRIGHT 2003 ACS

129:323954 Microstructure and properties of SiC/SiC and SiC/III-V nitride thin **film** heterostructural assemblies. Davis, Robert F.; Tanaka, S.; Kern, S.; Bremser, M.; Ailey, K. S.; Perry, W.; Zheleva, T. (Department of Materials Science and Engineering, North Carolina State University, Raleigh, NC, 27695-7907, USA).

Ceramic Microstructures: Control at the Atomic Level, [Proceedings of the International Materials Symposium on Ceramic Microstructures: Control at the Atomic Level], Berkeley, Calif., June 24-27, 1996, Meeting Date 1996, 629-636. Editor(s): Tomsia, Antoni P.; Glaeser, Andreas M. Plenum: New York, N. Y. (English) 1998. CODEN: 66QFA9.

AB Monocryst. thin **films**, multilayered heterostructures and solid solns. contg. selected combinations of SiC, AlN and GaN were grown on 6H-SiC(0001) substrates by gas-source MBE (GSMBE) or metalorg. VPE. Polytype control of the deposition of 3C(.beta.)-SiC(111) and 6H-SiC(0001) was achieved via control of the substrate orientation, temp. and gas phase chem. Essentially atomically flat AlN **films** or island-like features were obsd. using on-axis or vicinal 6H-SiC substrates, resp. The coalescence of the latter features at steps gave rise to incommensurate boundaries as a result of the misalignment of the Si/C bilayer steps with the Al/N bilayers in the growing **film**. The controlled growth of 3C-SiC **films** with low defect densities and atomically flat surfaces was achieved on the AlN **films** to form the 1st 6H-SiC/2H-AlN/3C-SiC multilayer heterostructures. Solid solns. of these two phases were also achieved. Monocryst. GaN(0001) or AlxGa1-xN (0.ltoreq.x.ltoreq.1) thin **films** were also grown on the AlN(0001) **films** or directly on the same SiC surface at 1100.degree., resp., via metalorg. VPE. The stages of growth of each of the above **films**, their microstructure and selected other properties are described.

IT **136479-14-6**, Aluminum silicon carbide nitride (Al0.8Si0.2C0.2N0.8) **210482-81-8**, Aluminum silicon carbide nitride (Al0.2-0.8Si0.2-0.8C0.2-0.8N0.2-0.8)
(gas source MBE and characterization of)

RN 136479-14-6 HCA

CN Aluminum silicon carbide nitride (Al0.8Si0.2C0.2N0.8) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.8	17778-88-0
C	0.2	7440-44-0
Si	0.2	7440-21-3
Al	0.8	7429-90-5

RN 210482-81-8 HCA

CN Aluminum silicon carbide nitride (Al0.2-0.8Si0.2-0.8C0.2-0.8N0.2-0.8) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.2 - 0.8	17778-88-0
C	0.2 - 0.8	7440-44-0
Si	0.2 - 0.8	7440-21-3

Al	0.2 - 0.8	7429-90-5

CC 75-1 (Crystallography and Liquid Crystals)
IT Molecular beam **epitaxy**
(of aluminum nitride and silicon carbide and their heterostructures)
IT Metalorganic vapor phase **epitaxy**
(of gallium nitride and aluminum gallium nitride solid solns.)
IT Microstructure
Surface structure
(of silicon carbide and Group IIIA pnictide **films** and heterostructures)
IT **136479-14-6**, Aluminum silicon carbide nitride (Al0.8Si0.2C0.2N0.8) **210482-81-8**, Aluminum silicon carbide nitride (Al0.2-0.8Si0.2-0.8C0.2-0.8N0.2-0.8)
(gas source MBE and characterization of)
IT 205438-87-5, Aluminum gallium nitride al0.05-0.96ga0.04-0.95n
(metalorg. VPE of **films** and superlattices and characterization)

L41 ANSWER 4 OF 7 HCA COPYRIGHT 2003 ACS
129:142833 Aluminum nitride-silicon carbide solid solutions grown by plasma-assisted, gas-source molecular beam **epitaxy**. Kern, R. S.; Rowland, L. B.; Tanaka, S.; Davis, R. F. (Department of Materials Science and Engineering, North Carolina State University, Raleigh, NC, 27695-7907, USA). Journal of Materials Research, 13(7), 1816-1822 (English) 1998. CODEN: JMREEE. ISSN: 0884-2914. Publisher: Materials Research Society.
AB Solid solns. of Al nitride (AlN) and Si carbide (SiC) were grown at 900-1300.degree. on vicinal .alpha.(6H)-SiC(0001) substrates by plasma-assisted, gas-source MBE. Under specific processing conditions, **films** of (AlN)x(SiC)1-x with 0.2 .ltoreq. x .ltoreq. 0.8, as detd. by Auger electron spectrometry (AES), were deposited. RHEED was used to det. the cryst. quality, surface character, and epilayer polytype. Anal. of the resulting surfaces was also performed by SEM. High-resoln. TEM (HRTEM) revealed that monocryst. **films** with x .gtoreq. 0.25 had the wurtzite (2H) crystal structure; however, **films** with x < 0.25 had the zincblende (3C) crystal structure.
IT **128515-75-3**, Aluminum silicon carbide nitride (Al0.3Si0.7C0.7N0.3) **136479-14-6**, Aluminum silicon carbide nitride (Al0.8Si0.2C0.2N0.8) **146640-20-2**, Aluminum silicon carbide nitride (Al0.2Si0.8C0.8N0.2) **210482-81-8**, Aluminum silicon carbide nitride (Al0.2-0.8Si0.2-0.8C0.2-0.8N0.2-0.8)
(plasma-assisted MBE and characterization of)
RN 128515-75-3 HCA
CN Aluminum silicon carbide nitride (Al0.3Si0.7C0.7N0.3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number

N	0.3	17778-88-0
C	0.7	7440-44-0
Si	0.7	7440-21-3
Al	0.3	7429-90-5

RN 136479-14-6 HCA
CN Aluminum silicon carbide nitride (Al0.8Si0.2C0.2N0.8) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.8	17778-88-0
C	0.2	7440-44-0
Si	0.2	7440-21-3
Al	0.8	7429-90-5

RN 146640-20-2 HCA
CN Aluminum silicon carbide nitride (Al0.2Si0.8C0.8N0.2) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.2	17778-88-0
C	0.8	7440-44-0
Si	0.8	7440-21-3
Al	0.2	7429-90-5

RN 210482-81-8 HCA
CN Aluminum silicon carbide nitride (Al0.2-0.8Si0.2-0.8C0.2-0.8N0.2-0.8) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.2 - 0.8	17778-88-0
C	0.2 - 0.8	7440-44-0
Si	0.2 - 0.8	7440-21-3
Al	0.2 - 0.8	7429-90-5

CC 75-1 (Crystallography and Liquid Crystals)
IT Molecular beam **epitaxy**
(plasma-assisted; of aluminum nitride-silicon carbide solid solns.)
IT **128515-75-3**, Aluminum silicon carbide nitride (Al0.3Si0.7C0.7N0.3) **136479-14-6**, Aluminum silicon carbide nitride (Al0.8Si0.2C0.2N0.8) **146640-20-2**, Aluminum silicon carbide nitride (Al0.2Si0.8C0.8N0.2) **210482-81-8**, Aluminum silicon carbide nitride (Al0.2-0.8Si0.2-0.8C0.2-0.8N0.2-0.8)
(plasma-assisted MBE and characterization of)

L41 ANSWER 5 OF 7 HCA COPYRIGHT 2003 ACS
119:128691 Solid solutions of aluminum nitride and silicon carbide grown by plasma-assisted, gas-source molecular beam **epitaxy**.
Kern, R. S.; Rowland, L. B.; Tanaka, S.; Davis, R. F. (Dep. Mater. Sci. Eng., North Carolina State Univ., Raleigh, NC, 27695-7907, USA). Journal of Materials Research, 8(7), 1477-80 (English) 1993. CODEN: JMREEE. ISSN: 0884-2914.

AB Solid solns. of Al nitride (AlN) and Si carbide (SiC), the only intermediate phases in their resp. binary systems, were grown at 1050.degree. on .alpha.(6H)-SiC(0001) substrates cut 3-4.degree. off-axis toward [11.hivin.20] using plasma-assisted, gas-source MBE. A **film** having the approx. compn. of (AlN)0.3(SiC)0.7, as detd. by Auger spectrometry, was selected for addnl. study and is the focus of this note. The **film** was monocryst. with the wurtzite (2H) crystal structure.

IT **111409-04-2**, Aluminum silicon carbide nitride (al0-1si0-1c0-1n0-1) **128515-75-3**, Aluminum silicon carbide nitride (al0.3si0.7c0.7n0.3)
(**epitaxy** of, plasma-assisted gas-source mol.-beam)

RN 111409-04-2 HCA

CN Aluminum carbide nitride silicide (Al0-1(C,N,Si)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0 - 1	17778-88-0
C	0 - 1	7440-44-0
Si	0 - 1	7440-21-3
Al	0 - 1	7429-90-5

RN 128515-75-3 HCA

CN Aluminum silicon carbide nitride (Al0.3Si0.7C0.7N0.3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.3	17778-88-0
C	0.7	7440-44-0
Si	0.7	7440-21-3
Al	0.3	7429-90-5

CC 75-1 (Crystallography and Liquid Crystals)

ST **epitaxy** aluminum silicon carbide nitride plasma

IT **Epitaxy**
(mol.-beam, of aluminum silicon carbide nitride, plasma-assisted gas-source)

IT **111409-04-2**, Aluminum silicon carbide nitride (al0-1si0-1c0-1n0-1) **128515-75-3**, Aluminum silicon carbide nitride (al0.3si0.7c0.7n0.3)
(**epitaxy** of, plasma-assisted gas-source mol.-beam)

L41 ANSWER 6 OF 7 HCA COPYRIGHT 2003 ACS

118:244816 Growth of silicon carbide and silicon carbide-aluminum nitride solid solution by container-free liquid phase **epitaxy**. Dmitriev, Vladimir; Cherenkov, Arthur (A.F. Ioffe Inst., 26 Polytech. St., St. Petersburg, 194021, Russia). Journal of Crystal Growth, 128(1-4), 343-8 (English) 1993. CODEN: JCRGAE. ISSN: 0022-0248.

AB SiC and SiC-AlN solid soln. were grown by container-free liq. phase **epitaxy** (CFLPE) from the Si melt suspended in a high frequency electromagnetic field. Substrate temp. was 1450-1700.degree.. The substrates were 6H-SiC crystals with a {0001} basal-plane orientation. Al (acceptor) and N (donor) were used as impurities. Growth rate of 6H-SiC **layers** was controlled in the range of 0.02 to 2 .mu.m/min. **Layers** were single crystal. The concn. Nd-Na was varied in the range of 8.times.1015 to 1.times.1019 cm-3. For p-type **layers**, Al concn. was controlled from 1.times.1018 to 2.times.1020 cm-3. Heteroepitaxial 3C-SiC **layers** were grown on 6H-SiC substrates from the liq. state. Min. half-width of the x-ray rocking curve of 3C-SiC **layer** was 11.5 arc sec. A red-light-emitting diode was fabricated based on a 3C-SiC/6H-SiC p-n heterojunction. Single crystal SiC-AlN solid soln. **layers** with AlN concn. up to 10 mol% were grown by CFLPE.

IT **147787-32-4**, Aluminum silicon carbide nitride (Al0-0.1Si0.9-1C0.9-1N0-0.1)
   (**epitaxy** of, container-free liq.-phase)

RN 147787-32-4 HCA

CN Aluminum silicon carbide nitride (Al0-0.1Si0.9-1C0.9-1N0-0.1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0 - 0.1	17778-88-0
C	0.9 - 1	7440-44-0
Si	0.9 - 1	7440-21-3
Al	0 - 0.1	7429-90-5

CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 73, 76

IT **Epitaxy**
   (liq.-phase, of silicon carbide and silicon carbide-aluminum nitride solid soln., container-free)

IT 7429-90-5, Aluminum, properties 7727-37-9, Nitrogen, properties
   (**epitaxy** and properties of silicon carbide doped with)

IT **147787-32-4**, Aluminum silicon carbide nitride (Al0-0.1Si0.9-1C0.9-1N0-0.1)
   (**epitaxy** of, container-free liq.-phase)

IT 409-21-2, Silicon carbide sic, properties
   (**epitaxy** of, container-free liq.-phase)

L41 ANSWER 7 OF 7 HCA COPYRIGHT 2003 ACS
115:61109 Silicon carbide-aluminum nitride solid solutions grown by the containerless liquid-phase **epitaxy**. Dmitriev, V. A.; Elfimov, L. B.; Lin'kov, I. Yu.; Morozenko, Ya. V.; Nikitina, I. P.; Chelnokov, V. E.; Cherenkov, A. E.; Chernov, M. A. (USSR). Pis'ma v Zhurnal Tekhnicheskoi Fiziki, 17(6), 50-3 (Russian) 1991. CODEN: PZTFDD. ISSN: 0320-0116.

AB The solid solns. (SiC)1-x(AlN)x on SiC-6H substrate were grown by liq.-phase **epitaxy**. The distribution of elements was analyzed by Auger spectroscopy. The obtained **layers** were monocryst. and the cathodoluminescence of the system with x = 0.07 was recorded.

IT **135021-79-3**, Aluminum silicon carbide nitride (Al0.07Si0.93C0.93N0.07)
(**epitaxy** and cathodoluminescence of)

RN 135021-79-3 HCA

CN Aluminum silicon carbide nitride (Al0.07Si0.93C0.93N0.07) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	0.07	17778-88-0
C	0.93	7440-44-0
Si	0.93	7440-21-3
Al	0.07	7429-90-5

CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 76

ST silicon carbide aluminum nitride solid soln; liq phase **epitaxy** soln; cathodo luminescence solid soln

IT **Epitaxy**
(liq.-phase, of aluminum nitride-silicon carbide solid solns.)

IT **135021-79-3**, Aluminum silicon carbide nitride (Al0.07Si0.93C0.93N0.07)
(**epitaxy** and cathodoluminescence of)

IT 409-21-2, Silicon carbide, properties 24304-00-5, Aluminum nitride
(liq.-phase **epitaxy** and cathodoluminescence of)

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L42 ANSWER 1 OF 9 HCA COPYRIGHT 2003 ACS
TI Si-B-C-N Ceramic Precursors Derived from Dichlorodivinylsilane and Chlorotrivinylsilane. 1. Precursor Synthesis

L42 ANSWER 2 OF 9 HCA COPYRIGHT 2003 ACS
TI Novel silicon-boron-carbon-nitrogen materials thermally stable up to 2200.degree.C

L42 ANSWER 3 OF 9 HCA COPYRIGHT 2003 ACS
TI Correlation of boron content and high temperature stability in

Si-B-C-N ceramics II

L42 ANSWER 4 OF 9 HCA COPYRIGHT 2003 ACS
TI Ceramic fibers for matrix composites in high-temperature engine applications

L42 ANSWER 5 OF 9 HCA COPYRIGHT 2003 ACS
TI Plastic forming of preceramic polymers

L42 ANSWER 6 OF 9 HCA COPYRIGHT 2003 ACS
TI Study of multicomponent nitrides and preparation of nitride powders and materials

L42 ANSWER 7 OF 9 HCA COPYRIGHT 2003 ACS
TI Polymeric silylcarbodiimides - novel route to Si-C-N ceramics

L42 ANSWER 8 OF 9 HCA COPYRIGHT 2003 ACS
TI Synthesis, Characterization, and Ceramic Conversion Reactions of Borazine/Silazane Copolymers: New Polymeric Precursors to SiNCB Ceramics

L42 ANSWER 9 OF 9 HCA COPYRIGHT 2003 ACS
TI Synthesis, characterization, and ceramic conversion reactions of borazine-modified hydridopolysilazanes: new polymeric precursors to silicon nitride carbide boride (SiNCB) ceramic composites

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L42 ANSWER 2 OF 9 HCA COPYRIGHT 2003 ACS
135:375291 Novel silicon-boron-carbon-nitrogen materials thermally stable up to 2200.degree.C. Wang, Zhi-Chang; Aldinger, Fritz; Riedel, Ralf (Department of Chemistry, Northeastern University, Shenyang, 110006, Peop. Rep. China). Journal of the American Ceramic Society, 84(10), 2179-2183 (English) 2001. CODEN: JACTAW. ISSN: 0002-7820. Publisher: American Ceramic Society.
AB Three novel Si-C-B-N ceramic compns., namely Si2.9B1.0C14N2.9, Si3.9B1.0C11N3.2 and Si5.3B1.0C19N3.4, were synthesized using the polymer-to-ceramic transformation of the polyorganoborosilazanes [B(C2H4Si(Ph)NH)3]n, [B(C2H4Si(CH3)NH)2-(C2H4Si(CH3)N(SiH2Ph))]n, and [B(C2H4Si(CH3)-N(SiH2Ph))3]n (Ph is C6H5), at 1050.degree.C in argon. The Si-B-C-N ceramics exhibited significant stability with respect to compn. and mass change at 1000-2200.degree.C, including isothermal annealing of the samples at the final temp. for 30 min in argon. The mass loss rate at 2200.degree.C was as low as 1.4 wt%.cntdot.h-1 for Si5.3B1.0C19N3.4, 1.7 wt%.cntdot.h-1 for Si2.9B1.0C14N2.9, and 2.4 wt%.cntdot.h-1 for Si3.9B1.0C11N3.2. The measured amt. of mass loss rate was comparable to that of pure SiC materials. As cryst. phases, .beta.-Si3N4 and .beta.-SiC were found exclusively in the samples annealed at 2200.degree.C at 0.1 MPa in argon. For thermodn. reasons, .beta.-Si3N4 should have decompd. into the elements silicon and nitrogen at that particular temp. and

gas pressure. However, the presence of .beta.-Si3N4 in our materials indicated that carbon and boron kinetically stabilized the Si3N4-based compn.

IT **339570-31-9P**, Boron carbide nitride silicide (BC11N3.2Si3.9)
374680-36-1P, Boron carbide nitride silicide (BC19N3.4Si5.3)
374680-38-3P, Boron carbide nitride silicide (BC14N2.9Si2.9)
(ceramics; polyorganoborosilazane conversion prepn. and properties of silicon boron carbonitride ceramics thermally stable up to 2200.degree.C)

RN 339570-31-9 HCA

CN Boron carbide nitride silicide (BC11N3.2Si3.9) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	3.2	17778-88-0
C	11	7440-44-0
B	1	7440-42-8
Si	3.9	7440-21-3

RN 374680-36-1 HCA

CN Boron carbide nitride silicide (BC19N3.4Si5.3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	3.4	17778-88-0
C	19	7440-44-0
B	1	7440-42-8
Si	5.3	7440-21-3

RN 374680-38-3 HCA

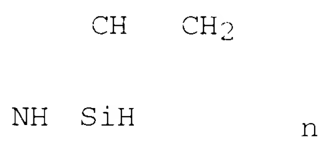
CN Boron carbide nitride silicide (BC14N2.9Si2.9) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
N	2.9	17778-88-0
C	14	7440-44-0
B	1	7440-42-8
Si	2.9	7440-21-3

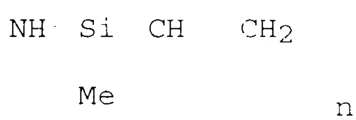
IT **144043-05-0D**, Poly[imino(ethenylsilylene)], branched boron derivs. **162124-80-3D**, Poly[imino(ethenylmethylsilylene)], branched boron derivs.
(precursor; polyorganoborosilazane conversion prepn. and properties of silicon boron carbonitride ceramics thermally stable up to 2200.degree.C)

RN 144043-05-0 HCA

CN Poly[imino(ethenylsilylene)] (9CI) (CA INDEX NAME)



RN 162124-80-3 HCA
CN Poly[imino(ethenylmethylsilylene)] (9CI) (CA INDEX NAME)



CC 57-2 (Ceramics)
Section cross-reference(s): 38

IT **339570-31-9P**, Boron carbide nitride silicide ($BC_{11}N_{3.2}Si_{3.9}$) **374680-36-1P**, Boron carbide nitride silicide ($BC_{19}N_{3.4}Si_{5.3}$) **374680-38-3P**, Boron carbide nitride silicide ($BC_{14}N_{2.9}Si_{2.9}$)
(ceramics; polyorganoborosilazane conversion prepn. and properties of silicon boron carbonitride ceramics thermally stable up to 2200.degree.C)

IT **144043-05-0D**, Poly[imino(ethenylsilylene)], branched boron derivs. 156938-37-3 **162124-80-3D**, Poly[imino(ethenylmethylsilylene)], branched boron derivs. 261921-89-5 261921-90-8 303015-36-3 303015-46-5
(precursor; polyorganoborosilazane conversion prepn. and properties of silicon boron carbonitride ceramics thermally stable up to 2200.degree.C)